Epidemiological and Psychological Investigations into the Association Between

Socioeconomic Inequality and Interpersonal Violence

A thesis submitted for the degree of Doctor of Philosophy

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Declaration

I, Jaye Lee McLaughlin, declare that the work presented in this thesis is my own and has not been previously or concurrently submitted for any other degree at Brunel University London or other institutions. It is clearly stated within the thesis, with appropriate citations, where information or data has been derived from other sources.

Abstract

Previous epidemiological research has demonstrated an association between economic inequality and the incidence of interpersonal violence, generally involving comparisons of homicide rates, on large geographical scales. This thesis aimed to further understand the nature of this association, and the proximate psychological mechanisms that underpin it, using epidemiological and survey research methods. Taking an epidemiological approach, Study 1 demonstrated that the association between inequality and interpersonal violence can be seen at the neighbourhood level in the UK, using two independent datasets recording incidents of mostly non-lethal violence in a novel setting. Using survey methods, Study 2 (n=193) began to explore the proximate psychological mechanisms that may link experiences of inequality with a proclivity for violence. Using various measures of individual perceptions of inequality at national and local levels it was found that perceived inequality did not predict self-reported levels of interpersonal aggression or consideration of future consequences (CFC). Consequently, in Study 3 (n=318), to capture participants' subjective experiences of inequality, feelings of personal relative deprivation (PRD) were measured in addition to Study 2's measures of perceived societal inequality, along with further psychological risk-factors for violence (impulsivity and risk-taking). Unlike for the Study 2 measures of perceived inequality, PRD was associated with all the measured psychological risk-factors for violence. Finally, Study 4 (n=195), which was pre-registered, aimed to replicate Study 3's main findings, and also consider the role of an important cultural factor thought to be involved in violence involving men in particular, endorsement of Masculine Honour Ideology (MHI), a trait associated with 'Cultures of Honour' such as in Southern US States. In this study, PRD was again associated with measured psychological risk-factors for violence, as well as MHI. Taken together the findings reported here help advance our understanding of how psychological responses to experiences of relative deprivation may be involved in generating observed associations between inequality and violence. Consequently, as is argued in the concluding chapter, this research may have important implications for how we tackle the problem of violence in society and could help inform interventions and policy initiatives.

Acknowledgements

It feels very strange to finally be writing this, and I find myself somewhat emotional. These past few years have been very difficult to say the least. Not because "PhD's are supposed to be hard"; but because for some, they are hard in ways that they are not supposed to be. I am extremely grateful for those who have supported me and stuck by me during this time (including my supervisor, Nick; my husband Will; my family; and my friends at Brunel). I could not have done this without you. I would also like to thank Nick for giving me the opportunity to do this PhD.

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1. Chapter 1: Thesis Introduction

1.1. Introduction

Violent crime could be described as a uniquely unsettling public concern (e.g. see news reports by Barr et al, 2018, April 27; and Kilraine, 2021, March 1). Shocking headlines from news outlets in recent years have warned the public about the prevalence of knife crime in the UK (e.g. Dearden, 2020, March 23; Dearden, 2020, April 23), and it is not unusual to find reports of specific incidents of homicides, stabbings and assaults in the crime sections of national news outlets. Moreover, violent crime accounts for a disproportionately high share of the economic and social costs of crime; equating to several billions of pounds per year (Heeks et al, 2018, pp. 6-7). This is particularly pertinent at a time when the economy has been so significantly affected by the Covid-19 pandemic (Partington, 2020, September 8). Epidemiological research indicates that one of the best predictors of violent crime is economic inequality (e.g. Krohn, 1976; Daly et al. 2001; Gartner, 1990).

Economic inequality is another major current social concern. A report published in 2015 regarding the level of economic inequality within OECD countries, showed stark economic differences between the richest and poorest segments of the population. The richest 10% of the population in 2012 was recorded as holding 50% of total household wealth; whereas the poorest 40% held only 3% (Keeley, 2015). The report claimed that levels of income inequality had been increasing over the past 40 years. Whereas the average income for the richest 10% of the population was 7 times more than the poorest 10% in the 1980s, this had increased to close to 9 times more at the time of the report's publication (Keeley, 2015). Moreover, using these measures, the UK was one of the most inequitable of 31 OECD countries in statistics for 2012; ranking as having the 5th highest level of inequality, after Israel, United States, Turkey, and Mexico (Keeley, 2015).

The success of popular books on the social effects of socioeconomic inequality, such as "The Spirit Level" by Wilkinson and Pickett (2009) suggests that public interest in inequality as a social issue, is increasing (The Equality Trust, n.d.; Wilkinson & Pickett, 2014, March 9). Inequality was a key topic mentioned in Barack Obama's 2014 State of the Union Address (Kay, 2014, January 29). There has also been significant coverage in UK mainstream media on inequality, and the disproportionate share of the nation's income received by the

top 1% of earners; with articles in the Guardian; BBC News; and the Telegraph (see examples in *Appendix A*). The Guardian now has a section dedicated to what they call 'The Inequality Project' (Herd, 2017, April 25), where they focus on issues related to economic inequality, and they have since published many articles on the subject (See *Appendix A* for examples). This focus in the media, and the public's attention, has also been reflected in UK politics. Ed Miliband wrote an essay in 2016 on 'The inequality Problem' (February 4). Inequality was a theme in the 2017 election; With the phrases "equality" and "inequality" mentioned multiple times in the Labour (Labour Party, 2017) and Conservative manifestos (Conservative Party, 2017). Inequality was also highlighted as an issue of serious concern following the Grenfall Tower fire; high rise social housing situated in the Kensington and Chelsea area, which has a mix of some of the most deprived, and most affluent areas of the country (see *Appendix A* for example articles).

1.2. The Relationship Between Inequality and Social Issues

It is clear that people are concerned about the moral implications of inequality in the world as a whole, as well as specifically within the UK. However, there may be more reason to be concerned about the persistence of inequality than the inherent moral implications. It could be argued that it is common knowledge that poverty is associated with many social issues. However, there is evidence to suggest that inequality too, creates a whole host of social problems (e.g. see Wilkinson & Pickett, 2009, p 27; Pickett & Wilkinson, 2015). In a study bringing together data from previously published research on health and social problems between countries, Wilkinson and Pickett (2009) found a positive association between the level of income inequality, and an index of health and social problems, comprised of data on; social trust; mental illness; life expectancy; infant mortality; obesity; educational performance; teen births; homicides; incarceration; and social mobility. Further studies have corroborated this finding at varying levels of geographical scale. For example, economic inequality has been found to be positively associated with depressive symptoms in a study comparing US counties (Fiscella & Franks, 2000); with psychotic symptoms, in a study comparing 50 countries (Johnson et al, 2015); and to negatively affect mental health in general (meta-analysis; Ribeiro et al, 2017). Negative associations have been found with self-rated health, in studies comparing US counties (Fiscella & Franks, 2000); and Chilean neighbourhoods (Subramanian et al, 2003); life expectancy (in a study comparing Chicago

neighbourhoods; Wilson & Daly, 1997) and educational attainment (in a study comparing countries; Thorson, 2014). Positive associations have been found with teen pregnancies (in studies comparing US counties; Gold et al, 2001; Maslowsky et al, 2019); mortality rates (comparing US States; Lochner et al, 2001); and of particular relevance to the present thesis, homicide rates (comparing Chicago neighbourhoods; Wilson & Daly, 1997).

1.3. The Association Between Inequality and Homicide

The association between economic inequality and homicide is not unique to just a few studies. Many studies have found socioeconomic inequality to be a significant predictor of violence or violent crimes, such as homicide. A cross national study by Krohn (1976) looked at the relationship between crime rates, and Gini (a measure of economic inequality), GNP per capita, and unemployment rate for 24 countries (using figures from 1950s-1970s); and found Gini to be the most strongly associated with homicide rates. Gartner (1990) also found Gini to be an independent predictor for homicide rates for 18 countries. In a study investigating the relationship between inequality and different causes of mortality, Kennedy et al (1996) found that a similar measure of inequality, the Robin Hood Index, explained more variation in homicide rates than it did for any other mortality rate, (although it was a stronger predictor for heart disease). When using the Gini Index as their measure of inequality, only homicide rates were significantly associated. Moreover, the results indicated that inequality was a better predictor of homicide rates than their measures of absolute deprivation (i.e. poverty). Similarly, Daly and Wilson (1997) compared median household income (a measure of absolute deprivation) and the Robin Hood Index (a measure of inequality) as predictors of homicide rates across 77 Chicago neighbourhoods, and found that when considered together, only the Robin Hood Index was an independent predictor of homicide rates. They then found inequality to be the only significant predictor of homicide rates (compared to median household income) when re-analysing this data using the Gini Index to measure inequality; and when analysing another dataset looking at 10 Canadian Provinces (Daly, et al 2001).

Homicides represent only a small proportion of violent crimes that take place; the majority of incidents do not result in death. If the relationship between economic inequality and homicides is a reflection of a relationship between inequality and violent behaviour, then one might expect inequality to predict levels of non-lethal violent crimes as well (Daly,

2017, p 14). Some studies have shown this to be the case. A study by Kelly (2000) for example, showed that inequality was a significant predictor for violent crime in urban U.S. counties (which consisted of murder, non-negligent homicide, forcible rape, robbery and aggravated assault), whereas poverty and police activity were shown to have significant effects on property crime. In another study, Danziger and Wheeler (1975) created a measure of relative inequality (R), and found it to be an independent predictor of burglary, robbery and aggravated assault for time series data (1949-1970) for the US. They also found inequality to predict crime rates in a cross-sectional analysis of Standard Metropolitan Statistical Areas (cities and their neighbouring areas) in 1960.

Whilst epidemiological studies such as these appear to indicate that there is an association between economic inequality and violence, the underlying psychological mechanisms that lead to these associations is poorly understood.

1.4. Existing Explanations for Violent Crime

General theories of crime have been developed in order to attempt to provide explanations for its existence. The classical view of crime views its origins as the same as any other behaviour; in that people will actively pursue positive experiences, and seek to avoid or reduce negative ones (Gottfredson & Hirschi, 1990). Crimes such as homicide for example, may be viewed as an attempt to remove a negative stimulus from one's environment. As described by Danziger and Wheeler (1975) the neoclassical view of crime is that people will choose whatever option they believe will maximise their utility; whether the chosen option is legal or not is irrelevant if that person determines the potential benefits to outweigh the cost of punishment. The reality of the situation is somewhat more complicated, as the costs are not necessarily guaranteed in any given decision; there is an associated risk attached to that decision which will determine how likely it is that the cost will be incurred. In this context the word "risk" is used to describe the high variance of potential "pay-offs" (Daly & Wilson, 2001). When people commit crimes, they are making risky decisions; they are essentially taking a gamble, with high potential costs, but also high potential rewards. However, the neoclassical view still stands as a fairly apt one; as the individual would be making a calculation of whether the reward is perceived to be worth the risk. Danziger and Wheeler (1975) explain that the logic behind increasing punishments for crimes is that an increase in the severity of punishment for crime will increase the cost,

hopefully outweighing the benefits. They go on to argue that it is also important to consider their perceived level of benefits, relative to their group.

In contrast, positivist criminology attempts to explain criminality as resulting from biological factors, such as genetics (Gottfredson & Hirschi, 1990). As discussed by Gottfredson and Hirschi (1990, p61), one limitation is that this appears to be based on the assumption that an individual can have a biological predisposition for a set of behaviours, that are defined as criminal by whichever political state the individual happens to be in. Gottfredson and Hirschi's (1990) theory on the generality of deviance attempts to combine classical and positivist theories, taking into account that deviance need not necessarily be limited to 'illegal' behaviours. It embraces the concept of costs and benefits, as well as the presence of individual differences, and biological predispositions to behave in certain ways, such as trait impulsivity, consideration of the future, and sensation seeking.

However, as previously mentioned, the psychological mechanisms that connect economic inequality and violence are poorly understood; and the above theories take little account of environmental factors. In order to understand the psychological mechanisms that underpin the association between economic inequality and violent crime, it should be considered how environmental factors and cues may interact with the above factors, and impact one's behaviour.

1.5. Income Inequality and Social Hierarchy

It has been posited by Wilkinson and Pickett (2009, pp 26-27), that income inequality is a measure of how hierarchical a society is. The presence of a steep hierarchy means that where an individual is placed in the hierarchy, could mean the difference between having an excess of resources, or very few, to none. It could be considered that this might create a highly competitive environment (something that will be discussed further). Moreover, if individuals at the lower ends of the distribution perceived socially acceptable (and less risky) routes to success, whether that be via education or legal forms of entrepreneurship, as inaccessible, it is conceivable that they might find alternative, riskier ways to compete; albeit this would entirely depend on whether the perceived gain from competing is high enough in value. This argument is important because it implies that those who commit crimes are not suffering from a pathology, they are rational people making the most from

their limited options (as discussed by Daly, 2017, p 1-2; Pepper & Nettle, 2017); or at least, as will be argued in the current thesis, what would have been the best in the human ancestral environment.

Whether these cost-benefit calculations are conscious and present at the individual level is not within the scope of this review; however, as will be argued in the current thesis, an evolutionary psychological perspective suggests that there will have been 'cost-benefit calculations' made over evolutionary time.

This cost-benefit theory may at first appear to imply that economic inequality should only result in crimes which are acquisitive, but previous studies have suggested that inequality leads to an increase in all kinds of violence, including violence that has no obvious financial or material incentive (but rather, a social one). However, as suggested by Daly and Wilson (1988), violent crime may be indirectly acquisitive. If one is to consider inequality in the human ancestral environment, it begins to become clear that what is acquired is not necessarily a tangible resource, but something that could be considered infinitely more valuable; that of social status.

An evolutionary psychology perspective is one that attempts to explain commonly observed behaviours by considering whether and how these may have been adaptive in human evolutionary history. An adaptation does not necessarily need to be something that 'feels' beneficial for the individual who exhibits that behaviour, but merely needs to have been beneficial for their 'fitness'; i.e. anything that facilitates their ability to pass the genetics that influence those behaviours (to at least some degree) on to the next generation.

1.6. Violence as an Adaptation

It has been theorised (e.g. see Daly, 2017, Ch. 3; Wilson et al, 2009; Pound et al, 2009) that the positive association seen between homicides (i.e. violence) and economic inequality in many contexts, reflects the functioning of psychological adaptations. Across cultures, the majority of homicides consist of men killing other men; whilst women are considerably less likely to kill other women (Daly & Wilson, 1988, Ch 7, pp. 147-148; Wilson et al, 2009). Furthermore, it has been shown that in the few countries where there is a relatively equal gender split amongst homicide victims; homicide rates are comparatively

lower (see Daly & Wilson, 1988; Daly, 2017). These facts, considered in conjunction with the competitiveness of inequitable environments described above, suggests that intra-sexual competition may play be a contributing factor to the regional variation in homicide rates. It is also known that intra-sexual violence within a species is partially related to its level of polygyny (Daly & Wilson, 1988, Ch. 7, p 146). Due to asymmetries in patterns of parental investment between males and females, in many species females effectively become a limiting resource over which males compete (Trivers, 1972). Accordingly, in many mammal species (including humans) sexual selection will have favoured the evolution of traits in males that facilitate success in intrasexual competition (Wilson et al, 2009).

For humans, Buss and Schmitt (1993) have provided some support for the proposed higher levels of mating effort in men compared to women, showing that men report more interest than women in short term mating strategies; higher interest in attracting higher numbers of mates; less stringent standards for desirable characteristics (in short term mates); a higher tolerance of certain undesirable characteristics; and a willingness to copulate sooner than females. Interestingly, these reports that men are willing to copulate sooner have been supported by confederate studies on a student campus, in which male participants were significantly more likely to agree to sexual invitations by women than women were to invitations by men (Clark & Hatfield, 1989; Clark, 1990); in fact, no women accepted a direct sexual invitation; whilst a smaller proportion of women accepted invitations to their apartment than men. It is important to note that a later experiment by Molzer (2003; as described by Voracek et al, 2005) found that 6.1% of women did accept a direct sexual invitation. However, this was not compared with a male equivalent, and is still a considerably lower acceptance rate than the 75% observed in Clark and Hatfield's study (1989). It also took place in bars and night clubs, as opposed to a student campus (see discussion by Voracek et al, 2005). A study by Wilder et al (2004) provides further support for the proposal that men are more likely to use a polygynous mating strategy, with the findings that our most recent common female human ancestor lived approximately twice as long ago as our most common recent male ancestor (so our most common male ancestor was considerably more recent).

If ancestral human mating systems were characterised by effective polygyny (as it would appear), it would be the males with the most desirable characteristics, and higher

social status, who are more likely to gain more (or indeed, any) mates, and could theoretically monopolise a large proportion of the population of females as reproductive partners. This monopolisation means that males at the 'bottom of the pile' could fail to reproduce at all; giving males good reason to compete with each other. Meanwhile, the men who are most successful will pass on the characteristics which made them successful in this competitive environment to more individuals in the next generation. The stakes were therefore much higher for men than they were for women in our evolutionary history (Wilson & Daly, 1985; Wilson et al, 2009; also see Trivers, 1972; Archer, 2009). When there is a steep socioeconomic hierarchy, with resources accumulating at the top of the distribution, the stakes will be higher than when there is lower socioeconomic gradient (i.e. a more egalitarian society). There is much more to win with increased status, and a higher possibility of losing out on resources of all kinds (including female mates) completely.

1.7. Unresolved Issues

1.7.1. The Problem of Bias in Crime Statistics

Considering the evolutionary reasoning proposed above, this needs to be investigated within the context of violent crime more generally, rather than exclusively for homicide. Wilson and Daly (1985) have reasoned that homicide rates can be used as a proxy measure of male intrasexual competition. They explain that the most common type of homicide is a result of a "trivial altercation" where both the victim, and the perpetrator are male. It is these trivial altercations, where the most significant reward is one's reputation (social status), that are theoretically most relevant to the evolutionary theory underlying this thesis (regarding male intrasexual status competition). Albeit, most trivial altercations will not lead to an actual homicide, but the ones that do should be relatively representative of how many take place (within the context of a comparative analysis). They are essentially an extreme measure of violence. The reason for wanting to use homicide as a measure was simply that it can be measured more reliably than assaults would be, particularly historically (Wilson & Daly, 1985). As Fajnzylbar et al (1998) said regarding the reliability of homicide as a proxy measure for violent crime; "Of all types of crime, intentional homicide is the one that suffers the least from under-reporting because corpses are more difficult to ignore than losses of property or assaults" (p 17). If one was able to find an association between economic inequality and violent crimes more generally, this could provide more weight to

homicide data used to support the arguments presented by Daly (2017), relating to socioeconomic inequality's relationship with male violence and competition.

As explained in detail in Chapter 2, one solution to the problem that not all violent incidents are reported to the police, is to look at alternative records of rates of violence. Local ambulance services for example, will record the nature of the incidents that they attend to, including whether or not there has been an assault against the person. Whilst a proportion of these assaults will be reported to the police, it is not automatically the case that they will be. It is also the case that not all cases involving the Police will require an ambulance. Whilst many violent altercations will take place without intervention of either of these services, the use of two relatively independent datasets such as these, should they show consistent results, essentially acts as a side-by-side replication, and can provide more weight to the arguments presented above regarding the relationship between inequality and levels of violence among populations.

1.7.2. The Predictive Power of Poverty Versus Inequality

It appears to be clear from the evidence presented previously that inequality is a predictor of violent crimes such as homicide, and several studies have shown inequality to be a better predictor than various measures of poverty. The difference between economic inequality and poverty lies in the relative nature of inequality. The term "poverty" is intended to describe an absolute level of deprivation, whereas economic inequality refers to the distribution of resources in a population. However, as discussed in Chapter 2, there is still some contention as to whether it is relative deprivation, or absolute deprivation that actually leads to violence, or whether both have something different to contribute, as studies have also found that poverty itself (i.e. absolute deprivation) correlates with and often appears to predict homicide (e.g. see Pridemore 2002 review; Pridemore, 2008; Gartner, 1990). This again relates to the fact that the underlying mechanisms that connect inequality and violence are poorly understood. It is not known what cues people are responding to, or what they are perceiving, that leads to an increased proclivity for violence (such as the feeling of being impoverished, or the feeling of being relatively 'worse-off' than some kind of reference group). Neumayer (2003, p 619) has claimed that policies targeting inequity have been ineffectual against violent crime, and that economic inequality's effect on crime applies more to property rather than violent crime (2003, p 623). However, Daly

(2017, Chapter 8) argues that Neumayer's findings on which they base this conclusion, came from an analysis which hid any diversity in policy, inequality, and violence between nations; as well asvariation that may arise from any lagged effects of inequality over the years. Furthermore, Daly (2017) has argued that there is no universal definition of absolute deprivation. What counts as being impoverished in one location, may not necessarily count as impoverished in another. This suggests that the definition of poverty is itself often relative in nature, making it difficult to disentangle the effects of absolute and relative levels of deprivation.

It is important to determine whether or not the relationship between increased homicide rates and inequality stems from a mutual relationship with absolute deprivation, because, as has already been indicated, the answer can be used to inform policy decisions aimed at reducing violent crime. In the study by Daly et al (2001) described previously, the relationship between economic inequality and average income ran in the opposite direction to what is usually the case, with higher inequity in more affluent provinces. The fact that Gini significantly predicted homicide rates rather than median income provides a strong case for the theorised effect of inequality on levels of violent crime, however, more studies of this nature are needed to corroborate this.

1.7.3. The Geographical Resolution of the Inequality – Violence Association

A further unresolved issue is the extent of geographical resolution at which the relationship between economic inequality and violence might exist. Previous studies described above have investigated the relationship at various geographical levels, but typically comparing large scale areas, such as countries, or states. Studies such as that by Danziger and Wheeler (1975), and Blau and Blau (1982) looking at Standard Metropolitan Statistical Areas are still relatively large in nature, with populations of approximately 50,000-100,000 people (Mayhew, 2015; Park & Allaby, 2017). This is especially pertinent when considering a criticism raised by Nisbett and Cohen (1996), that conclusions such as these should not be made on the basis of such highly aggregated data. It is not known at what scale inequality is perceived by an individual in order to go on and affect their behaviour. Investigations at finer geographical levels, and individual level investigations could improve the understanding of how inequality may affect an individual's behaviour.

1.7.4. Proximate Psychological Mechanisms

The research reviewed so far regarding the relationship between economic inequality and violence, whilst informative in its ability to reveal trends, is, as criticised by Nisbett and Cohen (1996), limited in that it is aggregated. The nature of aggregated data means it cannot show the individual level mechanisms that drive the relationship; i.e. how living in an inequitable environment may increase an individual's proclivity for violence.

As discussed in detail in later chapters, there are several psychological characteristics that are known risk-factors for violence, which could be investigated as candidate psychological mechanisms. Research has shown associations between aggression, criminal, or violent behaviour and a tendency to be less future oriented (e.g. Joireman, et al, 2003; Mahler et al, 2017; Nagin & Pogarsky, 2004; Trommsdorf & Lam, 1980). Several studies have shown violence and antisocial behaviour to be associated with higher levels of impulsivity (e.g. Gordon & Egan, 2011; James & Seager, 2006; Vogel & Van Ham, 2018). Some view violence as a form of risk-taking behaviour (Dahlbäck, 1990; Dhami & Mandel, 2012; Jones and Quisenberry, 2004), due to the high stakes, i.e. the highly variable outcomes it elicits. This is consistent with research showing associations between other risk-taking behaviours and decreased future orientation, impulsivity (e.g. Mishra et al, 2017), and violence (Coid et al, 2016). If one of the mechanisms linking inequality with violence is a tendency for inequality to increase one's propensity for risky behaviours, then this could be through either an overall preference for risk-taking, or an increase in risk-taking only in relevant life domains.

Furthermore, it is not currently known whether inequality only affects those at the bottom of the social hierarchy, or whether it affects the psychology of everyone within the distribution. As explained by Daly (2017), it is possible that those with more material resources merely have the capital to express, for example, high impulsivity, in ways that are safer, and considered to be more socially acceptable. Furthermore, it is not known when the psychological effects of inequality take place or how long they are maintained. For example, it may be that it is the experience of inequality during one's childhood development that leads to an increased proclivity for violence later in life; or it may be that the relationship is more plastic in nature, so that it is the level of inequality in one's current environment that is associated with this proclivity for violence.

1.7.5. The Role of culture

Nisbett and Cohen (1996) have criticised work focusing on economic variables to explain the high regional variation in crime rates, such as between US States. They instead argue that some of the observed patterns of geographical variation in homicide rates are due to the existence of regional cultures; such as what they call the 'Culture of Honour' in the southern US states (an argument that will be reviewed in more detail in Chapter 5). These cultures are said to highly value masculine honour, dominance, status, and the use of violence to defend one's property, and reputation. This has been demonstrated in research showing southern white male university students to respond more aggressively to a minor provocation, as well as showing higher increases in testosterone and cortisol than white northern university students (Nisbett & Cohen, 1996; Cohen et al, 1996). Nisbett and Cohen (1996) have argued that this culture of honour emerged as a result of the high proportion of herders who were early settlers in these states. They argue that the large area and low population density meant that law enforcement offered little protection from theft; meaning that theft of livestock was common. The ability to protect one's property became extremely important. Furthermore, a formidable reputation could help to protect one from theft, meaning that individuals' needed to be especially sensitive to any threat to their reputation, that could suggest they might not be capable of defending their property.

However, this is not necessarily incompatible the theorised relationship between inequality and violence. The situation in which cultures of honour are proposed to have been developed, appears to reflect a high level of socioeconomic competition; just as socioeconomic inequality is theorised to (e.g. Daly, 2017). Furthermore, Daly (2017, p 145) demonstrated that whilst more homicides are seen in southern US states, these are also the states which are higher in economic inequality. What is potentially more problematic, is Nisbett and Cohen's (1996) claim that this culture is self-perpetuating, and does not need to be sustained by economic factors. Research investigating whether the extent to which one adheres to masculine honour beliefs is associated with experiences related to economic inequality could provide some insight into the develop and maintenance of these cultures.

1.7.6. The Importance of Investigating the Unresolved Issues of the Inequality-Violence Association

The unresolved issues outlined above need to be investigated for two relatively simple practical reasons. Firstly, providing further empirical support for the theory that economic inequality leads to increased levels of violence, in novel contexts and using novel measures, provides more encouragement to politicians and policy makers to make efforts to reduce inequality. Secondly, understanding the intricacies provides more opportunities for intervention at every stage, and every level. If a framework was developed that can explain the common mechanisms at play, this can be used to help inform further policies; i.e. a double pronged approach that not only tries to reduce inequality, but also either interrupts the process by which it negatively affects one's psychology, or provides opportunity for individuals to express these psychological differences in a more positive way. A referential framework that outlines the common mechanisms linking inequality and violence could also be used at the individual level to help shape interventions for young people at risk, or for rehabilitation. Ultimately, any interventions needs to be beneficial for those who are at risk of violent behaviour, as well as the wider public; for both moral reasons, as well as in the name of sustainable change.

1.7.7. Research Aims

The research presented in the current thesis aimed to address unresolved issues in the existing literature surrounding the relationship between economic inequality and violent crime, using an evolutionary psychological perspective to inform the investigations carried out. Whilst previous literature has indicated that a relationship exists, some contention about the relative contribution of inequality and poverty persists. The research reported here addresses issues with the low geographical resolution common in previous work, and examines violent crime more generally and directly, rather than using homicide as a proxy measure for the prevalence of violence within areas. It investigates this within a novel UK neighbourhood setting.

Whilst some have used evolutionary theory to explain this relationship, the underlying psychological mechanisms that link experiences of inequality and increased proclivity for involvement in interpersonal violence, at the individual level, remain quite poorly understood. Much previous work looking at risk-factors for violence has not done so

within an evolutionary framework, and/or has not done so with consideration to the influence of socioeconomic inequality. Consequently, to address many unresolved issues in this area, the research reported in the current thesis begins to investigate how socioeconomic inequality is perceived at the individual level, and what psychological mechanisms may connect these perceptions with an increased proclivity for violence.

Furthermore, the research reported here also examines the role of culture, and how these mechanisms may be involved in the development and maintenance in cultures of masculine honour, which value the use of violence to defend one's status. Specifically, the current thesis reports the results of a novel investigation into the potential relationship between the experience of inequality and endorsement of masculine honour beliefs.

Chapter 2 reports the results of a novel epidemiological study (Study 1) investigating associations between socioeconomic inequality and violence at a fine geographical scale in the UK. The chapter introduction reviews previous epidemiological work that has demonstrated associations between economic inequality and violent crime in various contexts, and discusses the lack of consensus that remains on its predictive power relative to that of poverty. Previous work has largely taken place at low geographical resolutions, and has used homicide as a proxy measure to indicate the prevalence of violent crimes in those areas. Low homicide levels in the UK meant that this relationship had not been investigated within the UK. Study 1 investigated the relationship between economic inequality and violent crime between London neighbourhoods; a much finer geographical resolution than has previously been attempted. This aimed to elucidate important information regarding the geographical level at which inequality begins to affect behaviour. Study 1 addresses concerns about the potential under-reporting of violent crimes to the police, by using an additional, largely independent dataset from the London Ambulance Service. Results were expected to corroborate those found by previous epidemiological studies using homicide as a proxy measure for levels of violent crimes, providing further support for the association between inequality and violence, and suggesting that local inequality could be an important factor regarding the development of violent behaviour.

Chapter 3 reports the results of a survey study (Study 2), which investigated associations between perceptions of inequality in society and some key potential psychological risk factors for involvement in violence. The chapter introduction discusses

further the scale at which inequality may be perceived, and how it may perceived. It discusses the possible contributing factors of perceived personal social rank (both currently, and during development) as well as perceptions of overall inequality in society. Factors that may indicate a propensity for violence are reviewed, with a focus on present time orientation. Study 2 investigates perceptions of inequality at national and local levels, perceptions of one's social position, and potential indicators of relative social position, in relation to levels of interpersonal aggression and time orientation. A key measure of perceived inequality used in this study was taken from the International Social Survey Programme (ISSP, 2017) and has been used in previous studies examining perceived inequality, but not in the novel way it is used here – i.e. to predict behaviour at the individual level. This was an initial investigation intended to elucidate the underlying psychological mechanisms that connect inequality and violence at the individual level.

Chapter 4 reports the results of a survey study (Study 3), which extends the findings in Study 2 by considering whether perceptions of personal relative deprivation (PRD), rather than perceived inequality in society, might be more important mediators of the relationship between socioeconomic inequality and violence. In the chapter introduction, the possibility that one's subjective experience of inequality may be an important factor is reviewed, with consideration to a measure that indicates the extent to which one feels deprived relative to others in their respective reference group. Further risk-factors for violence were also reviewed, including impulsivity, and a propensity for risk; as factors that may be involved in the underlying psychological mechanisms that link inequality with violence. Study 3 investigated subjective feelings of personal relative deprivation alongside the measures of perceived inequality and social position used in Study 2. The study investigated whether these subjective socioeconomic measures were associated with any risk factors for violence, including those used previously in Study 2; interpersonal aggression, consideration of the future, impulsivity, and propensity for risk in various evolutionary domains. The study was particularly novel in that it simultaneously employed a measure of perceived inequality from the International Social Survey Programme (ISSP, 2017), alongside the Personal Relative Deprivation (PRD) scale (Callan et al, 2011) to examine which best predicted behaviour at the individual level. The primary aim of the study was to investigate whether feelings of personal deprivation are associated with psychological risk-factors for violence. Broader

aims were to explore which aspects of inequality affect one's psychology and behaviour, and which aspects of one's psychology and behaviour are affected.

Chapter 5 reports the results of a final survey study (Study 4), which extended the findings of Study 3 by considering, in addition to personal relative deprivation, also the role of masculine honour ideology as a potential psychological mechanism involved in the observed associations between inequality and violence.

The chapter introduction reviews the potential role of culture on one's proclivity for violence, and how this may fit in with the socioeconomic inequality-violence association, with focus on the role of cultures of masculine honour. Arguments regarding the contention about the relative contribution of culture and socioeconomic factors are reviewed. The role of socioeconomic inequality and intrasexual competition in the development and maintenance of these cultures of masculine honour are considered. Study 4 investigates male endorsement of masculine honour beliefs, and their association with feelings of personal relative deprivation, and psychological risk-factors for violence. Study 4 also looked to replicate associations found in Study 3 between feelings of personal relative deprivation and psychological risk-factors for violence. The study makes a novel contribution by simultaneously considering the consequences of inequality (perceived personal relative deprivation for some people) along with a key cultural factor though to contribute to the propensity to get involved in violence (i.e. masculine honour beliefs).

The concluding chapter (Chapter 6) discusses how the findings from the four empirical studies reported in the current thesis, taken together, make an important contribution to improving our understanding of the relationship between economic inequality and violent crime. Interpretation of the findings as a whole are discussed; how this fits in with the current literature; the implications in both an academic and social context; potential future applications of the research. Future directions for research are discussed, that could shed light on outstanding issues, such as protective factors that are able to interrupt the association between inequality and violence; the formation of reference groups that cause feelings of deprivation; and the role played by social media.

2. Chapter 2:   Study 1 - An Epidemiological Investigation into the Relationship Between

Economic Inequality and Violence in London Wards

2.1. Introduction

As explained in the introduction to this thesis, amongst the range of social difficulties associated with socioeconomic inequality (e.g. reduced life expectancy, increased rates of teen pregnancies, and mental health difficulties; Wilkinson & Pickett, 2009), violent crime is one that could be described as uniquely unsettling (e.g. see news reports by Barr et al, 2018, April 27, "Why is violent crime on the rise – and who is most at risk?"; and Kilraine, 2021, March 1, "Londoners concerns about violent crime could influence mayoral election"). It also has considerable financial impact. According to a 2015/16 report for crime in England and Wales, the Home Office reported that violent crime accounted for almost three quarters of the economic and social costs of crime against individuals despite only accounting for one third of instances; the highest costing offence being homicide, at £3.2m per instance (Heeks et al, 2018, p. 6). The total yearly cost reaching £1.8billion for homicide, 15.5bn for violent crime with injury, and £5.1bn for violence without injury (Heeks et al, 2018, p. 7). This is particularly pertinent at a time when the UKs finances have been so significantly impacted by the Covid-19 pandemic, for which the government response has accounted for almost a quarter of the entire year's public sector budget (Partington, 2020, September 8). There is therefore clear motivation to reduce violent crime not only from an ethical standpoint, but also from a financial one, which in turn has its own impact on the wellbeing of the population. Better understanding the relationship for the purposes of informing future interventions, could help both the country's difficult financial situation, and the population's well-being.

As explained in the introduction to this thesis, proponents of one evolutionary psychology perspective have suggested that this association is driven by the impact that socioeconomic inequality has on the degree of male intrasexual competition. An increase in male intrasexual competition is likely to affect male psychology in a way that predisposes them to engaging in riskier behaviours; which are, effectively, escalated social competition tactics. This includes a proclivity for violent behaviour towards other men (see e.g. Wilson et al, 2009; Daly, 2017). The risk to fitness associated with engagement in violent altercations,

is outweighed by the potential fitness costs associated with a loss of status, and the consequent reduction in access to mating opportunities.

Regarding the most extreme form of interpersonal violence, homicide, a range of studies have shown that socioeconomic inequality is one of the strongest predictors of variation in homicide rates between countries, cities and neighbourhoods (for a review see Daly, 2017).

Comparing countries, socioeconomic inequality has been shown to be a strong predictor of homicide rates, even after controlling for the predictive effects of Gross-national product (GNP) per capita, unemployment rates (Krohn, 1976), or welfare spending (Gartner, 1990; for adult homicide rates); which could arguably be considered as proxy measures for poverty. Whilst it is the case that high levels of inequality are often associated with high levels of absolute poverty within a population (i.e. it arises from stark differences between the top and the bottom of the economic hierarchy), the inclusion of poverty related measures alongside inequality measures in these studies acts as a control; allowing the influence of economic inequality over-and-above that of the poverty, that often comes with it, to be revealed. Wilson and Daly have examined the respective contributions of inequality and absolute poverty in their research. One study compared median household income (as a measure of overall area affluence) and the Robin Hood Index (a measure of income inequality) as predictors of variation in homicide rates across 77 Chicago neighbourhoods (Wilson & Daly, 1997). Whilst both median household (-.67) income and the Robin Hood Index (.75) were strongly correlated with homicide rate (p <.001), when considered simultaneously as predictors in a multiple regression, the Robin Hood Index, but not median household income, was a significant predictor of homicide rates. Daly et al (2001) then looked at the relationship between Canadian Provinces (n=10) using another measure of income inequality, the Gini index. They again found that their economic inequality measure (Gini Index) was a significant predictor of homicide rates, whilst median household income was not. This Canadian study was especially significant due to the unusual characteristic of Canada having a positive relationship between the level of economic inequality in its Provinces, and their corresponding provincial median household incomes. This means that there was a tendency for the provinces which were poorer (but more equitable), to have *lower* levels of homicides.

Similar associations are seen, using other alternative measures of inequality; e.g. Danziger and Wheeler (1975) created their own measure which they called Relative Inequality (R), which aimed to capture the amount of inequality in society as a whole. It was found to be a significant predictor of burglary, robbery and aggravated assault for time series data (1949-1970) for the USA, and when doing a cross-sectional analysis comparing crime rates for large US Census "standard metropolitan statistical areas" (SMSAs) in 1960, which included a range of socioeconomic and demographic predictors. Fajnzylber et al (2002a) found Gini to be a significant predictor of homicides (as an extreme proxy measure for violent crime) and robberies across countries, over time, despite controlling for GNP and Gross Domestic Product (GDP) growth.

Fajnzylber et al (2002b) investigated the possibility that alternative factors may be causing an indirect relationship between economic inequality and these crime rates, looking at both between and within country effects. Again, higher Gini coefficients for income were significantly associated with higher crime rates, but other factors (such as GDP per capita) were not. They argued that this reflected the importance of relative, rather than absolute income in regard to crime. The last two studies described support the relationship between inequality and crime but further brings up the issue of other crime types; the specific association between inequality and *violent* crime in particular is further supported by a study by Kennedy et al (1996), which found that when looking at the relationships between inequality and different forms of mortality, the strongest relationship was with homicide. Kaplan et al (1996) found inequality to be most strongly associated with violent crime and homicide, relative to other social issues such as medical expenditure and proportion of smokers; however these two studies show no comparison with other crime types. Further findings by Kelly (2000), showed inequality to be a significant predictor for violent crime (which consisted of murder, non-negligent homicide, forcible rape, robbery and aggravated assault) in urban U.S. counties, whereas poverty and police activity were shown to have significant effects on property crime. These combined findings are suggestive that inequality's association with violence may to some extent be a distinct issue, rather than just an extension of the association between inequality and social issues, or even crime in general. This would be consistent with an evolutionary psychology perspective of the

association, i.e. that it is driven by the effect that economic inequality has on male intra-sexual competition (e.g. See Daly, 2017; Wilson et al, 2009).

The studies so far discussed have indicated that there may be a particular relationship between economic inequality and violent crime, however it is important to note however that there have studies with results which are not consistent with this idea. Bourguignon (2000) found that whilst country Gini coefficients were correlated with the number of homicides, Gini's relationship with robbery rates was stronger. Although, it could be argued that robbery could be considered as simply an alternative, even more direct tactic for achieving status (through resources). Wu and Wu (2012) investigated the effect of male income inequality (measured via the 9th decile relative to the 1st) and unemployment rates on different crime rates across England and Wales (split into 10 regions) in the mid-1990s, and found inequality to predict most kinds of crime, *excluding* violent crime. They argue that this is because income inequality and unemployment are not good predictors for crimes for which there is no economic gain. Moreover, a study by Patterson (1991) compared poverty and inequality as predictors of violent crime in 57 small residential areas (in Rochester, New York; St. Louis, Missouri; and Tampa-St. Petersburg, Florida), and found only poverty to be significantly associated. Patterson said that this may be because a lack of resources limits a community's ability to exert social control, and that community crime rates were actually most strongly associated with non-economic characteristics, such as population transience, the proportion of young people, and family disorganization. So whilst there is a significant proportion of the research in the area which suggests there is a positive association between inequality and violent crime, the few inconsistencies show that more research is clearly needed on inequality as a predictor of violent crime. This is particularly true of the UK. The evolutionary nature of the theory means there is no clear reason why this relationship would not occur in the UK, but there is no evidence to support its existence in this location. This lack of evidence is likely due to the UKs low levels of homicide. As previously explained, much of the research on inequality and violence has focused on homicide. This could be explained by the fact that in previous decades, homicide was the most reliably measured form of violence. The acts themselves, and the details surrounding them were much more likely to be officially and correctly recorded by the authorities, compared to non-lethal violent crimes which were less likely to require their attention. Daly

actually cites this as their reason for choosing homicide as measure of violent behaviour in their research (Daly, 2017, Ch 1, pp. 6-7).

The low levels of homicide in the UK means there is not sufficient variability for statistical analysis. At the time of writing, there have been a limited number of studies looking at the relationship between economic factors and crime in the UK, but are looking at different kinds of crime. Witt et al (1998; 1999) investigated the effect of inequality on crime across England and Wales in two separate studies and found inequality to predict crime; however their crime figures only concerned various kinds of theft (burglary, car theft, etc.). A study by Machin and Meghir (2004) only looked at vehicle and property crime rates. The only exception is the study by Wu and Wu (2012), where the association was not found. However, modern policing procedures in the UK, i.e. police targets, and prevalent CCTV, mean that a greater proportion of assaults are being recorded by the police. The 2016 ONS statistical bulletin (ONS, 2017, January 19) stated that changes in how violence is recorded, and the inclusion of extra offenses in that category, lead to a 22% increase in recorded violence for that year.

2.1.1. Geographical Resolution

A further gap in our knowledge of the association between economic inequality and violence, is to what degree of geographical resolution this relationship holds true. It has so far been the case that the majority of studies on the topic have been at relatively large geographical resolutions, such as the country (e.g. Gartner, 1990; Krohn, 1976; Elgar & Aitken, 2011) or state level/province level (e.g. Kennedy et al,1996). There are few studies looking at local inequality. Two studies (Danziger & Wheeler, 1975; Blau and Blau, 1982) have found the association at the SMSA level in the US; a term used for cities and their socioeconomically associated areas in the 1950s (Rutherford, 2012, pp. 383, 563), reported as having populations of at least 50,000-100,000 people (Mayhew, 2015; Park & Allaby, 2017). Some smaller studies, such as those by Brush (2007), Patterson (1991), and Messner and Tardiff (1986), which were at the county level (Brush, 2007), and the neighbourhood level in the US (Messner & Tardiff, 1986; Patterson, 1991), did not show a consistent relationship between inequality and crime. Brush's (2007) study found Gini to be a significant predictor of crime rates in an initial cross-sectional analysis of US counties. However, in a follow up first difference estimation in crime rates from 1990-2000 (for the

purposes of controlling for static differences between counties) the relationship between Gini coefficients and crime rates was reversed. Brush suggests that that this either reflects a null effect of Gini, or an effect of an unmeasured variable that decreased crime rates during the 1990s; for example, (as suggested by Levitt, 2004, p.164), increased numbers of police; decreased drug use; or the legalisation of abortion. Brush discusses the possibility that factors resulting from income inequality could have been responsible for decreasing crimes rates; citing the example that having individuals with increased wealth, with higher tax codes, could facilitate increased recruitment within the police. Brush mentions that "results were similar when using violent crime or property crime as the dependent variable" (p. 266), but it is not clear whether this refers exclusively to an analysis that includes poverty as the predictor, or also to analyses that used Gini or alternative measures of income inequality as a predictor of crime rates. Brush also poses the possibility of a bias in the inequality estimates, which used alternative methods due to an absence of mean household income in the dataset. Patterson's (1991) study found that violent crime was associated with community characteristics, including residential instability, population density, percentage of individuals aged 12-20, and percentage of non-white residents. When neighbourhood economic condition was taken into account, the percentage of households with annual incomes below $5000 was a significant predictor, subsuming the previously found variance explained by the percentage of non-white residents, and the percentage of individuals aged 12 to 20. Gini was not found to be a significant predictor in these models. When looking at interaction terms, they did find that in neighbourhoods with a lower percentage of households earning below $5000 annually, higher numbers of single parent households were associated with increased violent crime rates; an association that was not found in neighbourhoods with higher proportions of low-income households. This interaction could arguably reflect another form of inequality. Similarly, in Messner and Tardiff's (1986) study (using within neighbourhood Gini coefficients based on individual income data), found that homicide rates in Manhatten neighbourhoods were best predicted by the proportion of those in poverty, and of those divorced or separated; finding no significant effect of Gini in their multiple regression analyses. Wilson and Daly (1997) on the other hand, investigated the relationship within Chicago neighbourhoods and found a significant association between inequality and homicide, but Chicago's then population of 2.7million is spread across 50 wards, made up of 100 neighbourhoods, suggesting an

estimated average of 27 thousand people in each neighbourhood. With the very few studies that exist looking at inequality at a fine geographical resolution; the inconsistent results between them; and the fact that their resolution is still relatively large; there is a clear gap in the research. It is particularly important to address this gap in research looking at local inequality in light of findings by Huby et al (2009), which showed that decreasing spatial resolution generally decreased inequality scores. This was the case for several measures of inequality, including Gini, which is the most commonly used. This suggests that information on inequality is actually lost when looking at inequality scores for larger geographical areas, highlighting the importance of looking at the relationship at finer geographical resolutions.

2.1.2. Investigating the Association Between Economic Inequality and Violence in London

In regard to UK research, London's high variation in levels of affluence between different parts of the city, and the availability of high-quality datasets on interpersonal violence, provide the opportunity to investigate associations between inequality and violence at a local level in the UK. As stated in The Trust for London Charity's London Poverty report for 2011 (MacInnes et al, 2011), there was a higher level of inequality in London than in any other region in England. In terms of income, the highest earning 10% of households in London earned 40% of all income in London; more than double the bottom 50% of households. When looking at wealth (as measured via savings and non-property assets), the wealthiest 10% was reported to account for two thirds of the wealth in London, whereas the bottom 50% accounted for "effectively zero in comparison" (pp. 41-43). It was also reported that Inner London had the highest proportion of people in the country's poorest decile, and the highest proportion of people in the richest decile of the country's population. Outer London was reported to have above average levels of people in the richest and poorest deciles. These statistics, whilst deeply concerning, certainly show that it would be well suited as a starting point for investigating inequality in the UK, with its areas of high wealth existing in close proximity to areas with high levels of poverty. This variation makes it possible to detect whether varying levels of inequality are associated with varying levels of violence. Furthermore, population, economic, police recorded violent crime, and London Ambulance service recorded assault statistics are available at the Lower Super Output Area (LSOA) level in London. LSOAs are small geographical areas in the UK with between 1000 and 3000 people living in each one. As seen in Figure 2.1, the variation in

income levels between neighbouring LSOAs is visibly apparent. Neighbouring LSOAs are also grouped together into Wards, which have an average of approximately 6500 people (ONS, 2012, November 23). This means that it is possible to investigate the relationship between economic inequality and violent crime rates at the Ward Level (to be further explained in the methods section of this chapter). This would be the finest geographical resolution at which this association has been investigated by a considerable margin. An indication of the scales at which this association exists could be extremely informative for further research; for example, in regard to looking at the underlying mechanisms of the association. Therefore, a study looking at this relationship in London would have the novelty of being both in the UK, and at a fine geographical resolution. The city also has the added benefit of the availability of assault rate statistics from the London Ambulance Service (LAS). This means that we can also see if the relationship is consistent in an alternative source of statistics on violence. Whilst these are not totally independent datasets, there will be inherent differences. Not all Police recorded assaults will require the use of an ambulance. Likewise, a proportion, but not all assault incidents recorded by the ambulance service will go on to be reported to the police. Regarding the circumstances in which NHS staff will contact the police about an assault incident themselves; their policy is vague. It is only when the NHS employee "has concerns that… an adult is at risk of harm or abuse, (that) they should… consider informing the local police." (NHS England, 2015, p. 14). In addition to this, it is worth noting that the ambulance data we are looking at will not include all assaults recorded by the hospital; it will only include assault patients who have utilised the ambulance service. This further increases the potential differences between the Police and London Ambulance Service assault data, suggesting that looking at both will provide corroborative value.

Figure 2.1

Quantile Map Showing London LSOAs (n= 4765) Divided into 5 Classes According to Average Income per Person per Year (2010/2011)
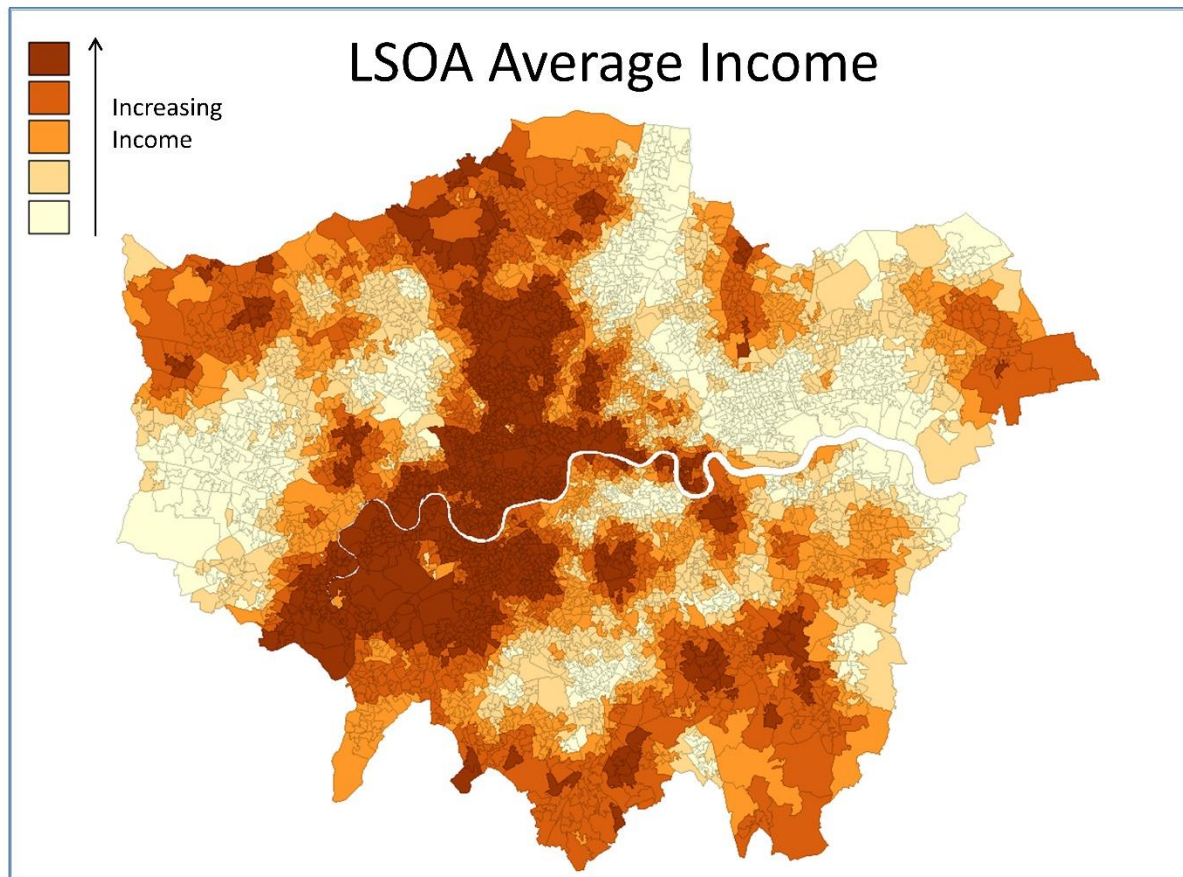
Note. Darker shades = higher average incomes.

2.1.3. How to Measure Inequality

As is apparent from the studies discussed, Gini is the most commonly used measure of inequality. When used to assess income inequality, a population's Gini coefficient is a ratio based on the Lorenz curve, which is the cumulative income of a population. Specifically, it is when the data (usually comprised of each individual's income) is ranked in order of increasing value and added to the preceding cumulative total, starting with the lowest, resulting in a curve showing the rate of accumulating income in the population. In the case of total equality this would result in a straight line, as each data point would increase by the same amount every time. The Gini coefficient for a population is the area between the 'equality line' and the curve, as a ratio of the total area underneath the

'equality line' (Porta, 2014). This is illustrated in Figure 2.2 (Porta, 2014). It is essentially a comparison between the amount that each individual contributes to the total income in a population, and the amount they would contribute if all money was distributed equally. A Gini coefficient can therefore range from 0-1, with 0 representing complete equality, and 1 representing all the income being received by one individual/household/unit. However, alternative measures were reviewed (see thesis introduction) to ensure that the method most appropriate for the study was used. Measures such as the Atkinson Index, generalised entropy index, the proportion of income earned by the top or bottom X% of the population, and Decile ratios are unnecessarily flexible, requiring the user to focus on specific, but potentially arbitrary parts of the distribution. When considering other measures, such as the Palma ratio (a specific decile ratio), the Coefficient of Variation (which can be infinitely large in value and be heavily influenced by outliers), the Theil, and the Robin Hood Index (also based on the Lorenz curve), they seem conceptually to be relatively equal to Gini in terms of their suitability for this data (e.g. see De Maio, 2007, for an in depth review of some of these measures). Moreover, several of these inequality measures have been empirically compared within the context of inequality and violence. Kawachi and Kennedy (1997) aimed to determine whether the relationship between inequality and mortality rates could depend on the kind of inequality measure used. They compared the Gini coefficient; the decile ratio; the proportions of total income earned by the bottom 50%, 60%, and 70% of households; the Robin Hood Index; the Atkinson Index; and Theil's entropy measure. They put each measure of inequality into separate multiple regressions, comparing them with median income, and a poverty index indicating the amount of people below the federal poverty line. In every analysis, it was found that all measures remained significant predictors of mortality rates (with r values ranging from .50 to .66). Pearson correlations between the measures of inequality showed that all were highly correlated with each other (r ≥ .94). This suggests that whilst these measures may differ slightly, and some may be suited to particular kinds of data, they are all on relatively equal footing and any one of these would be good measures to use when investigating the effects of inequality. As Gini has been shown to have a consistent relationship with homicide rates; it can be used to measure income or wealth inequality; and it is the most commonly used inequality measure, it was the most obvious candidate for measuring inequality in this investigation.

Figure 2.2

The Lorenz Curve
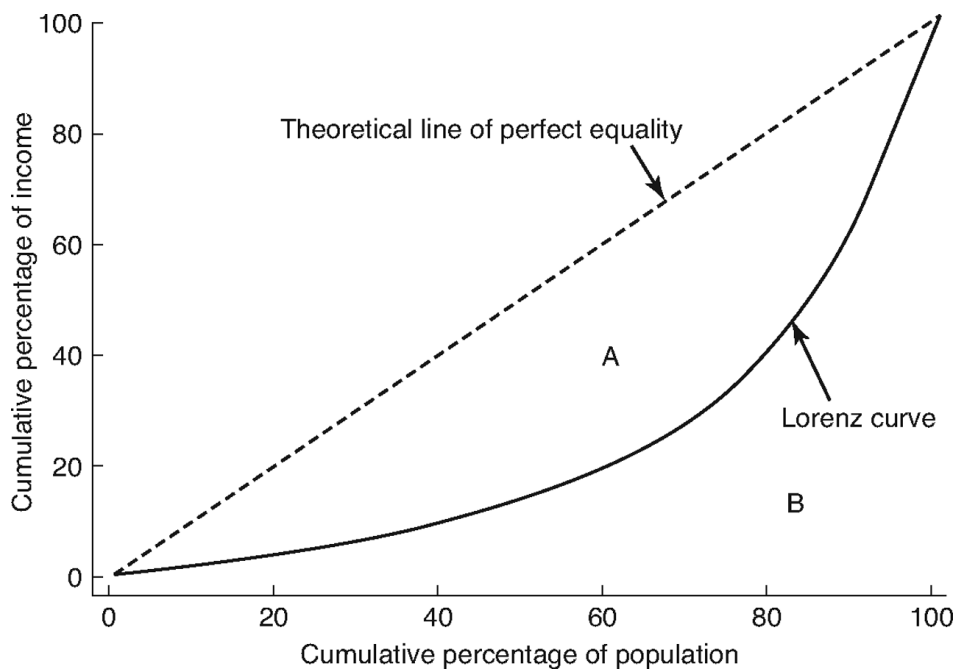
Note. The Lorenz curve demonstrating the cumulative income of a population. The Gini coefficient for a population is the area between the 'equality line' and the Lorenz curve (A), as a ratio of the total area underneath the 'equality line' (A + B). Image originally published in "Gini coefficient (2008)." By Porta, M., 2014, A dictionary of epidemiology (5th ed.) Oxford University Press

2.1.4. Aims

Local population and income data were used to calculate the levels of inequality, affluence, and rates of violence for each of London's electoral wards. The current study aimed to see whether inequality (as measured by Gini) could predict levels of recorded violence on the small geographical scale of London neighbourhoods (electoral wards).

2.2. Methods

2.2.1. Data Sources

2.2.1.1. Demographic and socioeconomic data

London ward and Lower Super Output Area (LSOA) population and income statistics were used to calculate the levels of inequality and affluence for each electoral ward (excluding the City of London). Average income per person was calculated for each Ward/LSOA, similar to previous studies (e.g. Wilson & Daly, 1997, Daly et al, 2001). Data was used for the year 2010/2011, in order to use data from the 2011 census rather than population estimates. Data on ward population size (Census Information Scheme, 2013), number of households (Greater London Authority, 2013c) and average income per household (Greater London Authority, 2013a), was used to calculate the average income per person for each ward.

A Gini coefficient was calculated for each ward ("Ward Gini"), to quantify the degree of inequality in income per person between the LSOAs that comprise the ward. As explained previously, a Gini coefficient is based on the difference between the actual amount that each individual contributes to the total income for the area, and the amount that they would contribute if all money was distributed equally (see Figure 2.2). Whilst it was not possible to obtain this information for every individual in London, data on average household income (Greater London Authority, 2013a), number of households (Greater London Authority, 2013b), and population numbers (Greater London Authority, 2013b) for each LSOA meant it was possible to calculate a Gini coefficient for each ward ("Ward Gini"), by treating each LSOA as an individual. However, Deltas (2003) has provided evidence that the Gini is biased downwards in small sample sizes; this was important to consider in the case of this dataset, which had an average of only 7 LSOAs per Ward. However, Deltas (2003) provides an alternative formula (as previously used by Deaton [1997, p139]) which is adjusted to account for this bias, for which the adjusted Gini coefficient will converge with the standard Gini coefficient as the sample size increases, meaning it can be used for all sample sizes. This adjusted formula was used instead of the original Gini formula, meaning that areas with high levels of inequality would be allowed to approach a coefficient of 1, despite the small sample sizes involved. The original and adjusted formulas are shown below:

The original Gini Formula:

$$G_n = \frac{(1/n^2) \sum\limits_{i,j} |y_i - y_j|}{2\overline{y_n}}.$$

Gini Formula adjusted for small sample sizes (Deltas, 2003):

$$\hat{G}_n = \frac{1}{\overline{y}n(n-1)} \sum\limits_{i>j} \sum\limits_{j} |y_i - y_j|.$$

This adjusted formula was used to calculate the Gini coefficient for each Ward (a "Ward Gini"), using LSOA average incomes as each individual data point. The resulting ward Gini coefficients therefore reflected the level of disparity between the average incomes of their constituent neighbourhoods (LSOAs) (rather than a direct measure of inequality based on each individual inhabitant's income).

Ward Gini quantified the degree of inequality for each Ward. Ward average income represented the overall level of affluence.

2.2.1.2. Violence and Assault data

The association between inequality and violence was investigated using two largely independent datasets. Data on crimes recorded by the Metropolitan Police Service (Greater London Authority, 2013b), and population numbers from the 2011 census (Census Information Scheme, 2013) were used to calculate the average number of violent crimes per 1000 people per month in each Ward for the period April 2010-March 2012. This included all notifiable offences categorised as "violence against the person" which includes the following: assault with injury; common assault; harassment; homicide; offensive weapon; other violence; wounding/GBH (grievous bodily harm) ("Crime Type Definitions", Metropolitan Police, n.d.). The population values used were taken from 2011 Census. From this point onwards, this data will be referred to as the "violent crime rates".

A second violence dataset published by the London Ambulance Service (2014) was used for the purposes of corroboration. This dataset includes all callouts for which, paramedics or other ambulance staff, have recorded retrospectively that they believe an assault took place (London Ambulance Service, 2015, November 19). While the published

data do not indicate sex of offender, they do provide separate totals for "Assaults on Women". Consequently, for each ward, incidence rates (incidents per month per 1000 population) were calculated for Total Assaults, Assaults on Men, and Assaults on Women for the period April 2010 to March 2012.

2.2.1.3. Exclusions

Of the 628 electoral wards within Greater London, 4 of these lie within the City of London. Crimes within the City of London wards are recorded by the City of London Police rather than the Metropolitan Police, and was not included in the dataset, giving an N of 624 wards. To account for changes in population size; the boundaries for 99 of the LSOAs, across 71 of these 624 wards, changed in 2011. This included LSOAs which were split; LSOAs which were merged; and LSOAs that had complex changes. There was variation between the data sources as to whether the data used the new or old boundaries, e.g. the London Ambulance Service assault data used the (pre-2011 boundaries) old boundaries, whereas the population numbers from ONS used the new (post-2011) boundaries. Significant efforts were made to try reconcile these data sources, but for the sake of consistency, it was ultimately decided that all Wards that contained LSOAs with boundary changes would be excluded from all analyses leaving 534 wards. This was to ensure that both the London Ambulance Service and the Metropolitan Police assault data were directly comparable with each-other. Moreover, it avoids problems associated with including areas which have undergone very substantial changes in population (e.g. due to housing developments) during the study period. In addition, an extreme outlier, in this case The St. James wards, was also excluded from the analysis due to the extremely high crime levels in these locations (17.19 and 15.32 standard deviations above the mean for the London Ambulance Service and Metropolitan Police Data sets respectively). It is possible that these extremely inflated crime rates are due to high levels of commuters and tourists. This was considered particularly relevant considering the claims made by Saunders (2010), that several of Wilkinson and Pickett's (2008) correlations with inequality presented in The Spirit Level were being skewed by outliers, such as the U.S (which has a particularly high homicide rate), and Japan (which has a particularly high life expectancy). This left a final sample of 533 wards.

2.2.2. Design

Initial bivariate correlations were carried out on the variables, including between the two economic independent variables in order to check for potential issues of autocorrelation. This was followed by two sets of hierarchical multiple regressions, where the inequality measure Gini was compared with average income as a predictor of interpersonal violence. The first set was carried out on the Metropolitan Police recorded violent crime rates as the dependent variable, and the second set with the London Ambulance Service recorded assault rates as the dependent variable. Gini was predicted to be a significant predictor of violence in both sets of data, independent of mean income.

2.2.3. Ethics

Ethical approval was obtained prior to analysing the data (ethical approval reference number: 3833-LR-Oct/2016- 4148-1). Ethical approval form can be seen in *Appendix B*.

2.3. Results

The descriptive statistics for the 533 Wards analysed in London are shown in Table 2.1, and the LSOAs (*n* = 4218) in Table 2.2. Wards had an average of 7 (*SD* = 1.29) Lower Super Output Areas (LSOAs) each (range: 3 - 12). The total population number in the sample was approximately 687,1823; with an average number of 12892.73 of people per Ward (*SD* = 2365.78).

Table 2.1

Population Numbers, Mean Assault Rates (London Ambulance Service), Violent Crime Rates (Metropolitan Police Service) and Mean Annual Income per Person (2010/2011) for 533 Electoral Wards in London

Ward variables	Before outlier exclusion (*n* = 534)		After outlier exclusion (*n* = 533)	
	M (SD)	Range	*M* (SD)	Range
Number of LSOAs	7.62 (1.28)	3 – 12	7.63 (1.29)	3 – 12
Ward population	12895.46 (2362.53)	5110 – 20049	12892.73 (2365.78)	5110 – 20049
Ward mean annual income per person (2010/11)	£20495.61 (£8981.20)	£9022.03 – £69116.38	£20455.19 (£8940.88)	£9022.03 – £69116.38
Ward Gini (2010/2011)	.064 (.033)	.011 – .205	.064 (.033)	.011 – .205
Assaults per 1000 population per month	0.39 (0.32)	0.06 – 5.54	0.38 (0.23)	0.06 – 1.69
Violent crimes per 1000 population per month	1.51 (1.03)	0.36 – 17.29	1.48 (0.77)	0.36 – 5.68

Note. Statistics shown are for Wards that did not contain LSOAs with boundary changes. Population numbers, and mean income per person calculated from 2011 census data and

Greater London Authority income data for 2010/11. Assaults are those recorded by the London Ambulance Service (April 2010 – March 2012). Violent crimes are those recorded by the Metropolitan Police (April 2010 - March 2012).

Table 2.2

Population Numbers, Mean Assault Rates (London Ambulance Service), Violent Crime Rates (Metropolitan Police Service) and Mean Annual Income per Person (2010/11) for LSOAS in London

LSOA Variables	Before Outlier Exclusion (*n* = 4071)		After Outlier Exclusion (*n* = 4065)	
	M (SD)	Range	*M* (SD)	Range
LSOA population	12895.46 (2362.53)	5110 – 20049	12892.73 (2365.78)	5110 – 20049
LSOA mean annual income per person (2010/11)	£20451.64 (£8932.44)	£9022.03 – £69116.38	£20455.05 (£8941.03)	£9022.03 – £69116.38

Note. Statistics shown are for LSOAs in Wards that did not contain LSOAs with boundary changes. Population numbers, and mean income per person calculated from 2011 census data, and Greater London Authority 2010/11 data. Assaults are those recorded by the London Ambulance Service (April 2010 – March 2012). Violent crimes are those recorded by the Metropolitan Police (April 2010 - March 2012).

2.3.1. Bivariate Associations Between Mean Income, Gini and Violence

Two-tailed Pearson correlations were carried out to examine bivariate associations between Ward mean income, Gini, assault rates and violent crime rates.

Table 2.3

Bivariate Associations (Pearson's Correlation Coefficients) Between Assault Rates (London Ambulance Service), Violent Crime Rates (Metropolitan Police Service) and Mean Annual Income per Person (2010/11) and Ward LSOA Gini (2010/11) For 533 Electoral Wards in London

Variable	Assaults per 1000 population per month		Violent crimes per 1000 population per month	
	r	*p*	*r*	*p*
Ward mean annual income per person (2010/11)	-.159	<.001	-.136	.002
Ward Gini (2010/11)	.224	<.001	.238	<.001

Note. Ward Gini coefficients and mean incomes (per person) were calculated from income data from the Greater London Authority, and 2011 census data. Assaults are those recorded by the London Ambulance Service (April 2010 – March 2012). Violent crimes are those recorded by the Metropolitan Police (April 2010 - March 2012).

Figure 2.3

Scatter Plot Showing the Association Between Ward Mean Annual Income per Person (2010/11) for 533 London Electoral Wards, and the Number of Violent Crimes per 1000 Population per Year (Metropolitan Police, April 2010 –March 2012) in Those Wards
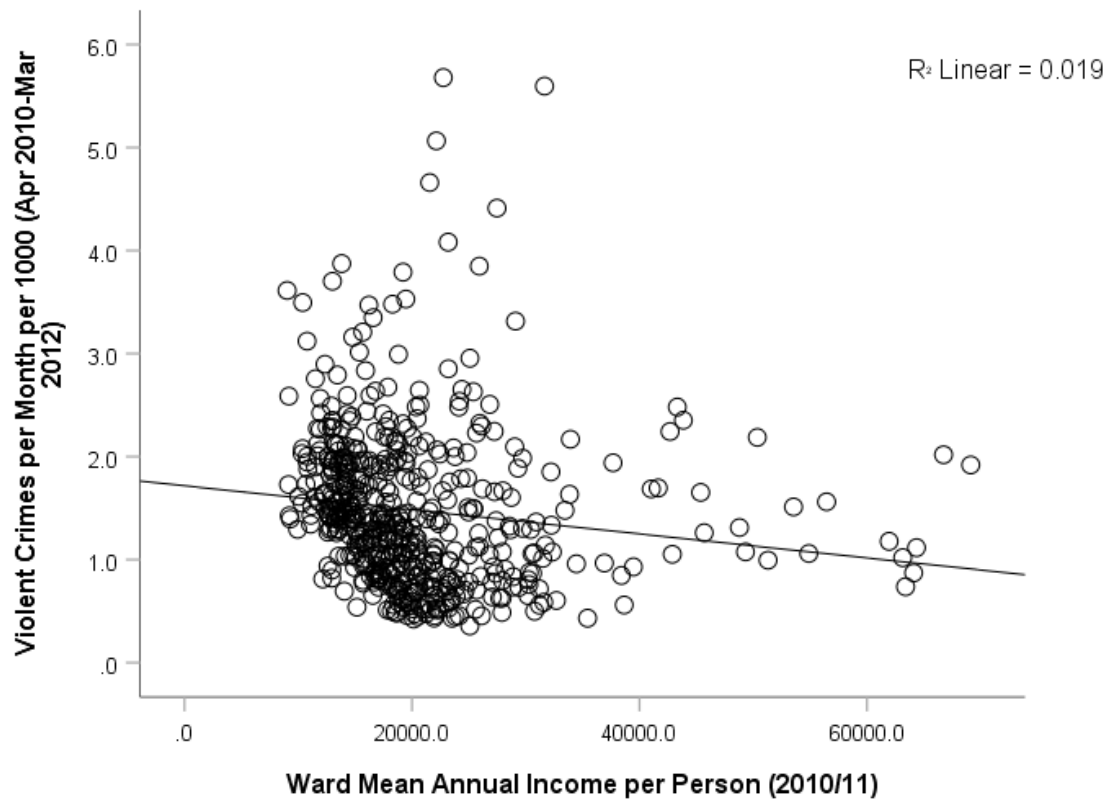
Figure 2.4

Scatter Plot Showing the Association Between Ward Mean Annual Income per Person (2010/11) for 533 London Electoral Wards, and the Number of Assaults per 1000 Population per Year (London Ambulance Service, April 2010 –March 2012) in Those Wards
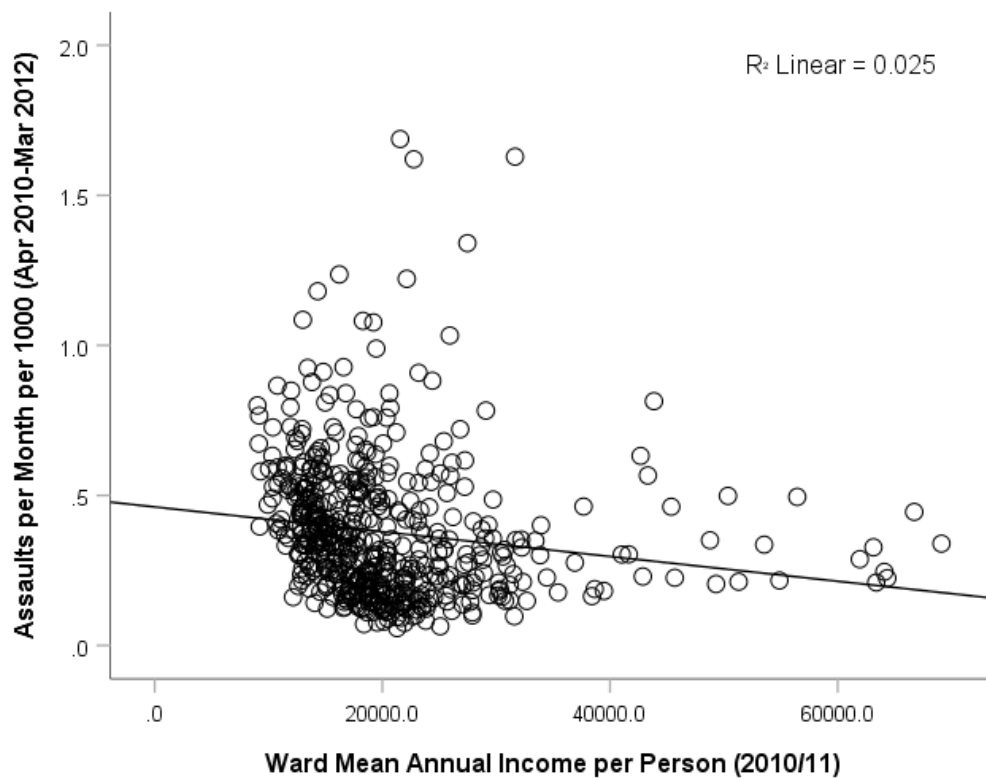
Figure 2.5

Scatter Plot Showing the Association Between Ward Gini (2010/11) for 533 London Electoral Wards, and the Number of Violent Crimes per 1000 Population per Year (Metropolitan Police, April 2010 –March 2012) in Those Wards
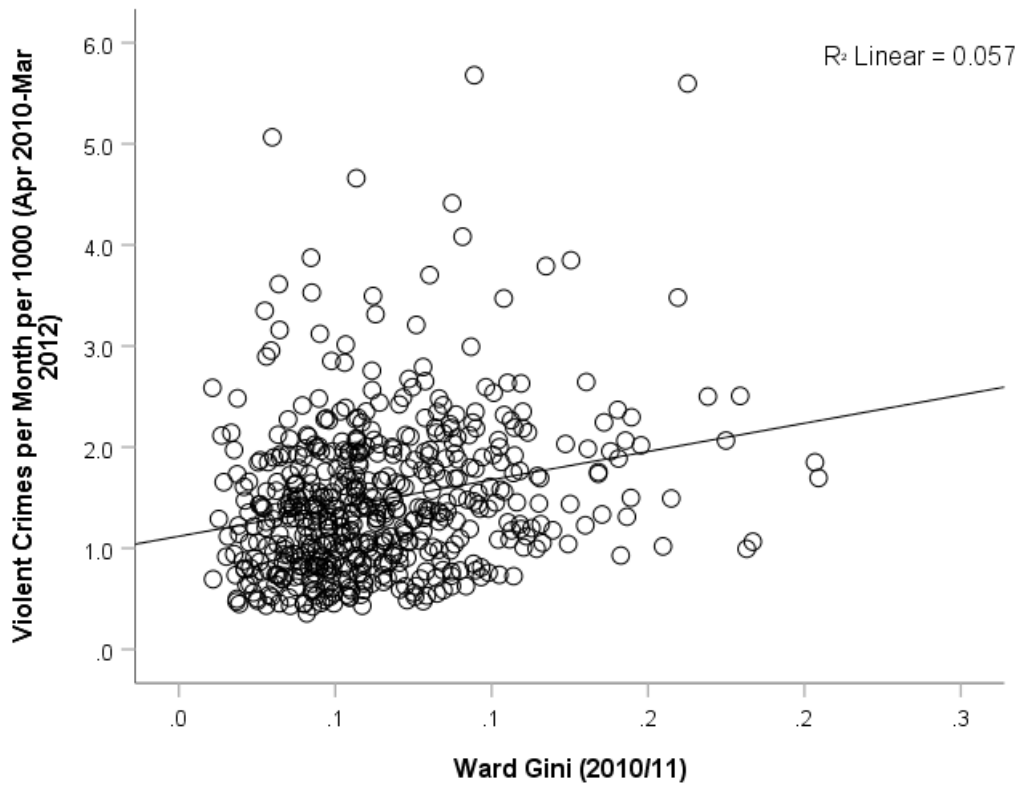
Figure 2.6

Scatter Plot Showing the Association Between Ward Gini (2010/11) for 533 London Electoral Wards, and the Number of Assaults per 1000 Population per Year (London Ambulance Service, April 2010 –March 2012) in Those Wards
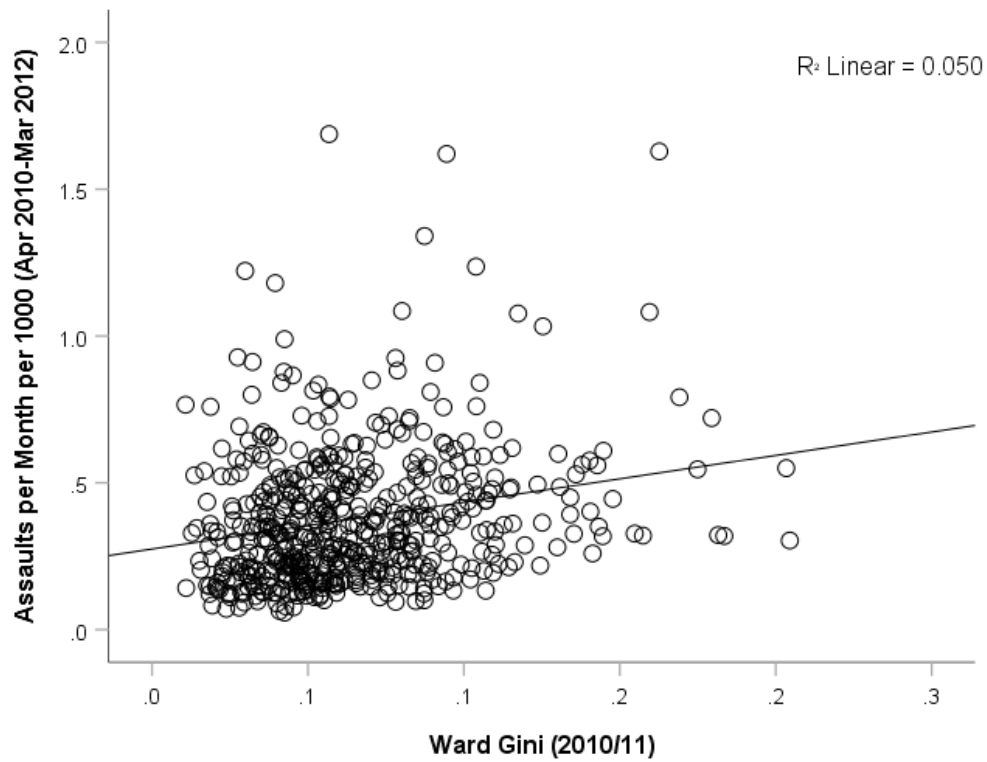
A Pearson (two-tailed) correlation was also carried out between ward Gini and ward mean income. Mean income was found to be significantly positively correlated with Gini ($r = .260$, $p < .001$), meaning that there is a trend towards wards with higher average incomes being more unequal. This suggests that the relationship between ward inequality (as assessed by the Ward Gini) and assault rates is not a biproduct of an association between higher inequality scores in poorer areas.

Figure 2.7

Scatter Plot Showing the Association Between Mean Annual Income per Person (2010/11) for 533 Electoral Wards in London, and the Corresponding Gini Coefficients (2010/11) for those Wards
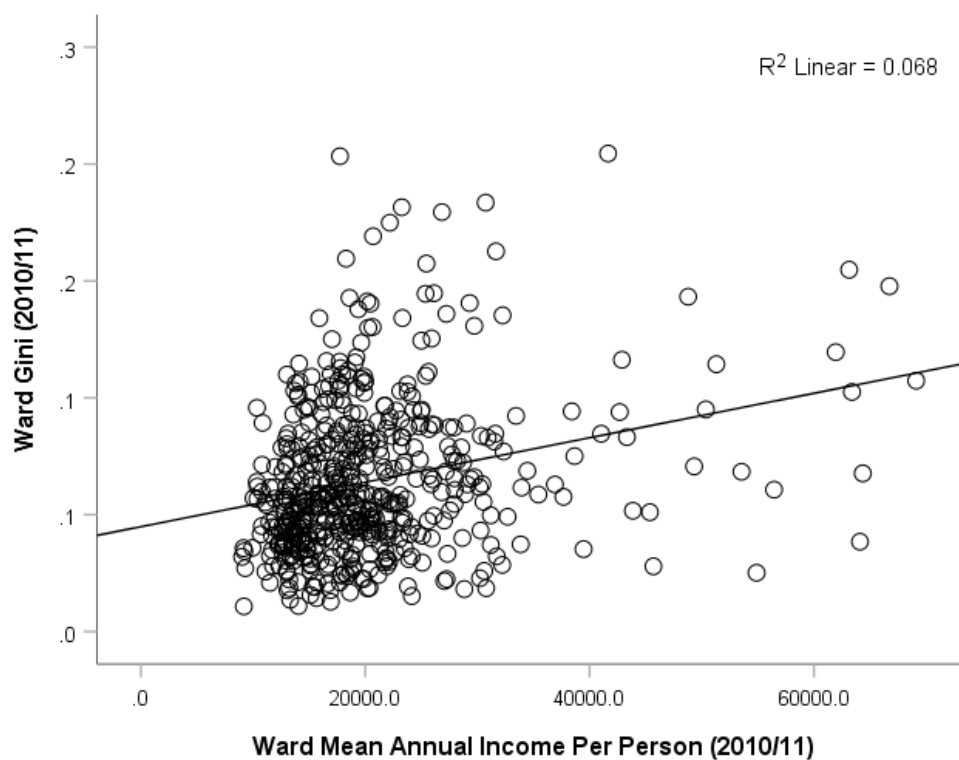
2.3.2. Gini and Mean Income as Predictors of Assault and Violent Crime Rates

In order to see how much variation in assault rates mean income and Gini can each account for when considered simultaneously as predictors, hierarchical multiple regressions were carried out for each set of data, comparing 3 models in both cases. Model 1 calculated how well mean income predicted assault rates (as recorded by the ambulance service), and violent crimes (as recorded by the police). Model 3 calculated how well Gini predicted assaults and violent crimes. These were compared with Model 2 (which used both predictors), to see whether adding Gini to the model improved the model more than adding mean income.

2.3.2.1. Police data

Table 2.4

Ward Mean Annual Income per Person (2010/11) and Gini (2010/11) as Predictors of Violent Crime Rates (Metropolitan Police) for 533 Electoral Wards in London

	β^a	t	F	p	R^2
Model 1 (Income only)			10.03	.002	.019
Ward mean annual income per person (2010/11)	-.136	3.17			
Model 2 (Gini only)			31.86	<.001	.057
Ward Gini (2010/11)	.238	5.64			
Model 3 (Both predictors)			29.03	<.001	.099
Ward mean annual income per person (2010/11)	-.213	4.98			
Ward Gini (2010/11)	.293	6.87			
Δ Model 1 →Model 3			47.15	<.001	.080
Δ Model 2 →Model 3			24.77	<.001	.042

Note. Ward Gini coefficients and mean incomes (per person) were calculated from Greater London Authority income data for 2010/2011, and 2011 census data. Violent crime rates are those recorded by the Metropolitan Police (April 2010 - March 2012).

a. Standardised β coefficient.

Model 1 (Table 2.4) shows that ward mean income is a significant predictor of violent crime rates, $F(1, 531) = 10.03$, $p = .002$, $R^2 = .019$. In Model 2, it can be seen that Gini alone is a better predictor of violent crime rates than mean income alone, $F(1, 531) = 31.86$, $p < .001$, $R^2 = .057$. Adding Gini to the mean income improves the model more than adding

mean income to Gini (Change in R^2 of .080, vs .042). Model 3, which includes both ward

mean income and ward Gini, is a better predictor of violent crime rates, $F(2, 530) = 29.03$, p

$< .001$, $R^2 = .099$, than mean income (Model 1) or Gini (Model 2) alone; with both proving to

be significant independent predictors. Figures 2.8 and 2.9 demonstrate the individual

variances explained by each predictor against the residuals of the other.

Figure 2.8

Partial Regression Plot Showing the Variance in Violent Crimes per 1000 Population per Year,
(Metropolitan Police, April 2010 –March 2012) Explained by Ward Gini (2010/11) After
Controlling for Ward Mean Income per Person (2010/11) (Unstandardised Residuals)
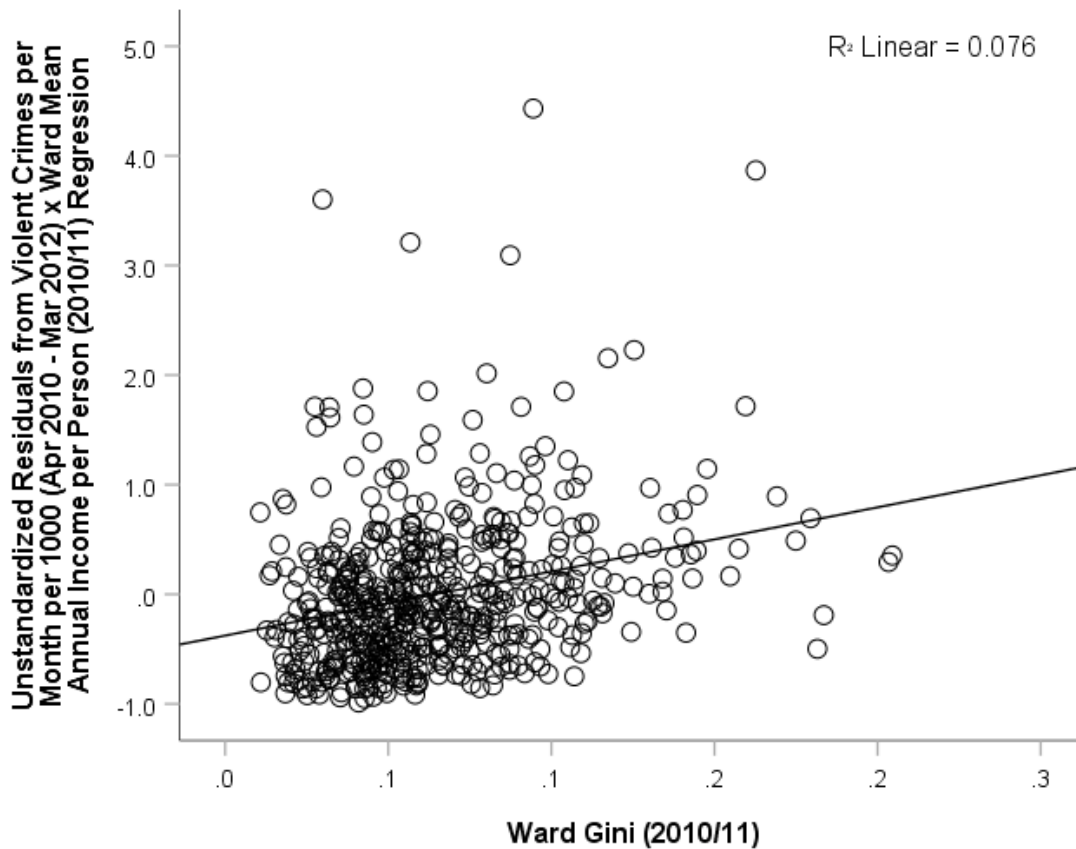
Figure 2.9

Partial Regression Plot Showing the Variance in Violent Crimes per 1000 Population per Year, (Metropolitan Police, March 2010 – December 2012) Explained by Ward Mean Income per Person (2010/11) After Controlling for Ward Gini Coefficients (2010/11) (Unstandardised Residuals) for 533 London Electoral Wards
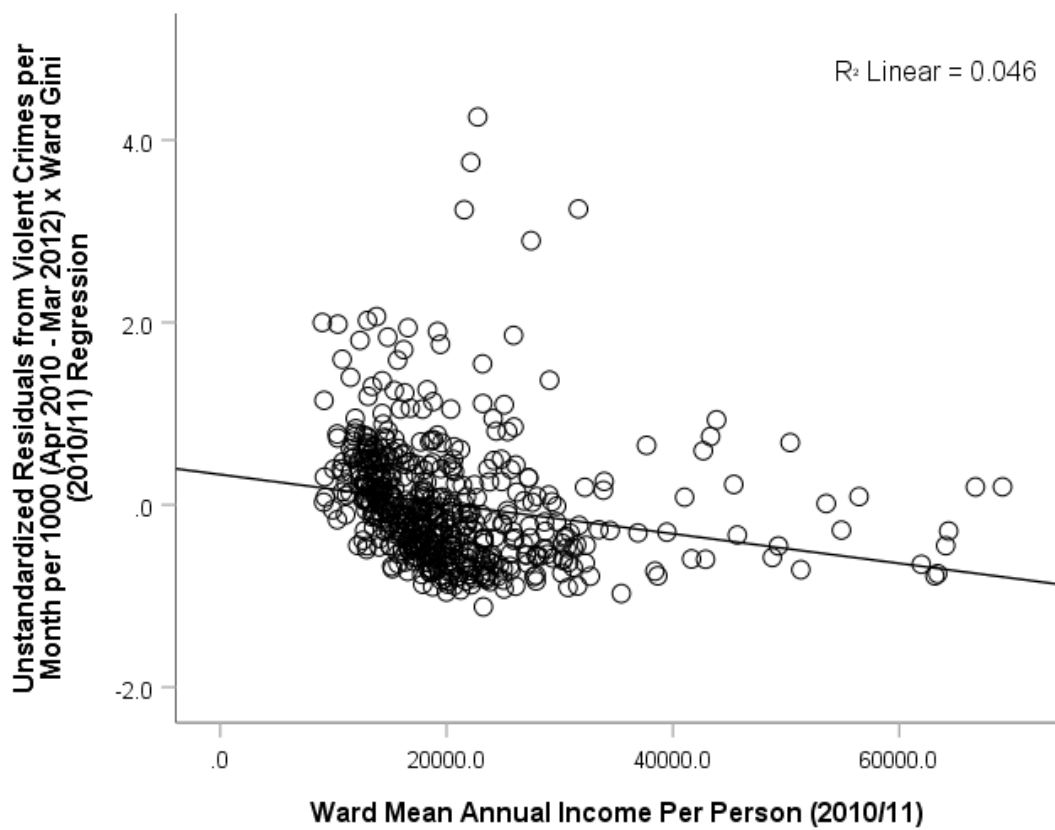
2.3.2.2. Ambulance data

Table 2.5

Ward Mean Annual Income per Person (2010/11) and Ward Gini (2010/11) as Predictors of Assault Rates (London Ambulance Service) for 533 Electoral Wards in London

	β[a]	t	F	p	R^2
Model 1 (Income only)			13.76	<.001	.025
Ward mean annual income per person (2010/11)	-.159	3.71			
Model 2 (Gini only)			28.09	<.001	.050
Ward Gini (2010/11)	.224	5.30			
Model 3 (Both predictors)			29.74	<.001	.101
Ward mean annual income per person (2010/11)	-.233	5.47		<.001	
Ward Gini (2010/11)	.285	6.68		<.001	
Δ Model 1 →Model 3			44.60	<.001	.076
Δ Model 2 →Model 3			29.87	<.001	.051

Note. The β values shown are standardised. Ward Gini coefficients and mean incomes (per person) were calculated from income data from the Greater London Authority and 2011 census data. Assaults are those recorded by the London Ambulance Service per 1000 population per month, for the period April 2010 – March 2012.

a. Standardised β coefficient.

Model 1 (Table 2.5) showed that ward mean income was a significant predictor of ward assault rates, $F(1, 531) = 13.76$, $p < .001$, $R^2 = .025$. In Model 2, it can be seen that ward Gini alone is a better predictor of ward assault rates than ward mean income alone, $F(1,$

531) = 28.09, $p < .001$, $R^2 = .050$. Model 3, which includes both ward mean income and ward Gini, predicted ward assault rates better than Models 1 and 2, $F(2, 530) = 29.74$, $p < .001$, $R^2 = .101$. Figures 2.10 and 2.11 demonstrate the individual variances explained by each predictor against the residuals of the other. Adding Gini to mean income improved the model more than adding mean income to Gini (Change in R^2 of .076 vs .051).

Figure 2.10

Partial Regression Plot Showing the Variance in Assaults per 1000 Population per Year, (London Ambulance Service, April 2010 – March 2012) Explained by Ward Gini (2010/11) After Controlling for Mean Income per Person (2010/11) (Unstandardized Residuals) for 533 London Electoral Wards
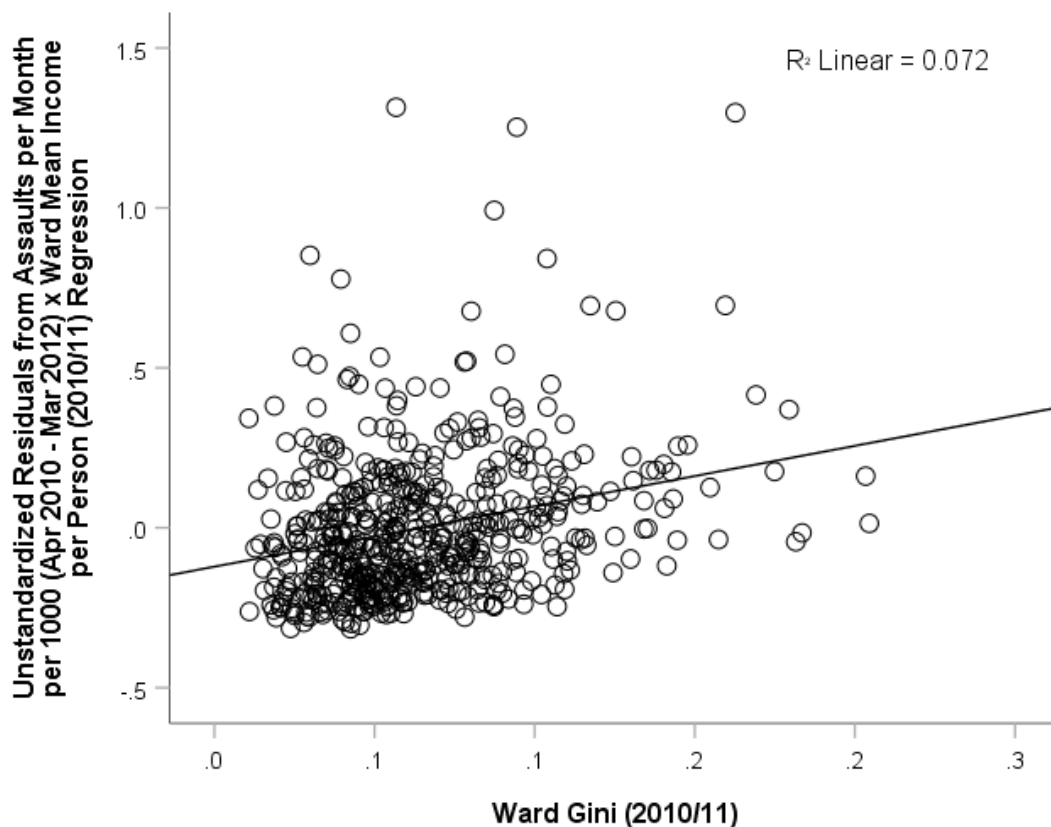
Figure 2.11

*Partial Regression Plot Showing the Variance in Assaults per 1000 Population per Year
(London Ambulance Service, April 2010 – March 2012) Explained by Ward Mean Income
(2010/11) After Controlling for Ward Gini Coefficients (2010/11) (Unstandardized Residuals)
for 533 London Electoral Wards*
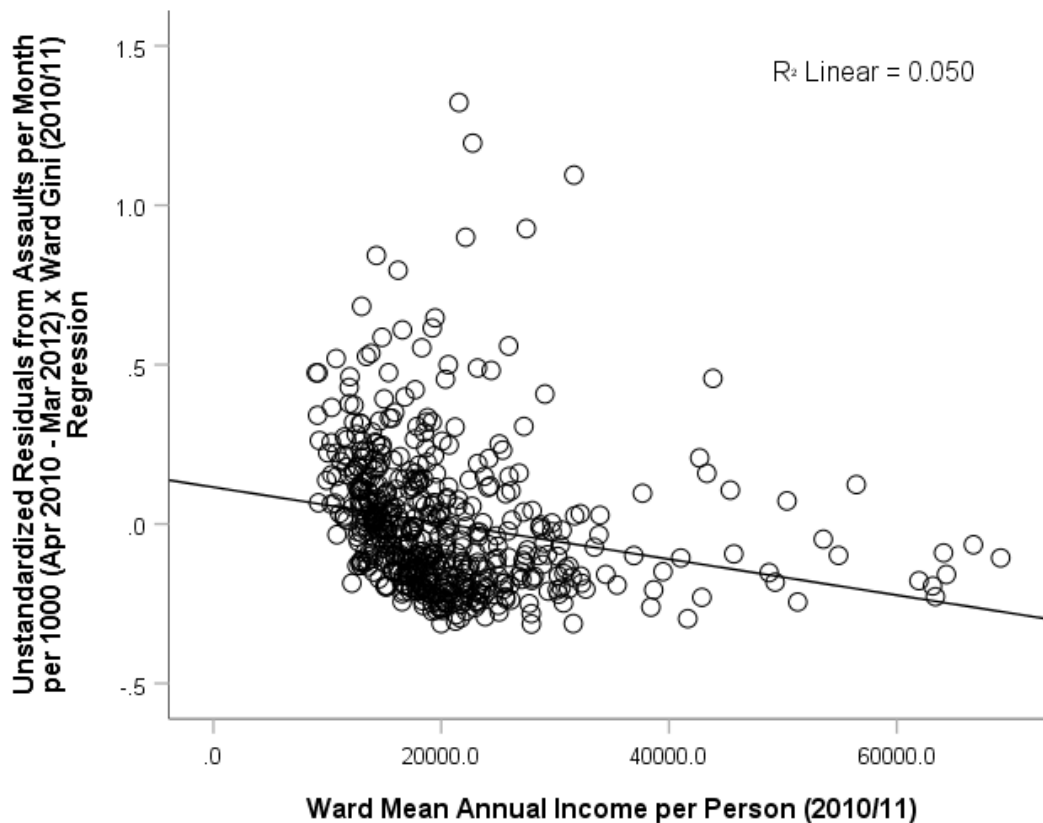
2.3.2.3. Assaults excluding assaults on women

The decision was made to use additional data provided by the London Ambulance
Service, to examine whether levels of inequality predict assaults on male victims specifically.
Although neither the London Ambulance Service or Metropolitan Police data could be split
by sex of perpetrator, data was available from the London Ambulance service on the
number of assaults against women in each LSOA, meaning it was possible to subtract these
from the total assault figures, and create a measure of the incidence of assaults that would
more accurately reflect rates of male-male violence. This data was treated in the same way
as the previously used data on the overall incidence of assaults, giving the number of
assaults (excluding women) per 1000 population, per month, for each ward.

Bivariate correlations showed this variable to be significantly correlated with all other variables (Table 2.6). Multiple regression analysis (Table 2.7.) showed significant associations with both predictors, but with indications that the association with mean income was marginally weakened. Model 1 showed that mean Ward mean income was a significant predictor of assault rates, $F(1, 531) = 7.52$, $p = .006$, $R^2 = .014$. In Model 2, it can be seen that Gini alone is a better predictor of assault rates than mean income alone, $F(1, 531) = 29.49$, $p < .001$, $R^2 = .053$. Model 3, which includes both ward mean income and Ward Gini, predicts assault rates better than Models 1 and 2, $F(2, 530) = 25.12$, $p < .001$, $R^2 = .087$. Figures 2.12 and 2.13 demonstrate the individual variances explained by each predictor against the residuals of the other. Adding Gini to mean income improved the model more than adding mean income to Gini (Change in R^2 of .073 vs .034).

Table 2.6

Bivariate (Pearson's) Associations Between London Ambulance Service Recorded Assault Rates (Including and Excluding Women Victims), Violent Crime Rates (Metropolitan Police), Ward Gini (2010/11) and Mean Annual Income per Person (2010/11) For 533 London Wards

Variable	Assaults/1000 population/month	Violent crimes/1000 population/month	Ward Mean Annual Income/person (2010/11)	Ward Gini (2010/11)
	r(p)	*r(p)*	*r(p)*	*r(p)*
Assaults/1000 population/month excluding women	.987(<.001)	.902(<.001)	-.118(.006)	.229(<.001)
Assaults/1000 population/month	-	.914(<.001)	-.159(<.001)	.224(<.001)
Violent crimes/1000 population/month	-	-	-.136(.002)	.238(<.001)
Ward Mean Annual Income/person (2010/11)	-	-	-	.261(<.001)

Note. Ward Gini coefficients and mean incomes (per person) were calculated from income data from the Greater London Authority and 2011 census data. Assaults are those recorded by the London Ambulance Service (April 2010 – March 2012) per 1000 population per month. Violent crimes are those recorded by the Metropolitan Police (April 2010 - March 2012) per 1000 population per month.

Table 2.7

Ward Mean Annual Income per Person (2010/11) and Ward Gini (2010/11) as Predictors of Assault Rates (London Ambulance Service), Excluding Assaults on Women, for 533 Electoral Wards in London

	β^a	t	F	p	R^2
Model 1 (Income only)			7.52	.006	.014
Ward mean annual income per person (2010/11)	-.118	2.74			
Model 2 (Gini only)			29.49	<.001	.053
Ward Gini (2010/11)	.229	5.43			
Model 3 (Both predictors)			25.12	<.001	.087
Ward Mean Annual Income per person (2010/11)	-.191	4.44		<.001	
Ward Gini (2010/11)	.279	6.49		<.001	
Δ Model 1 →Model 3			42.14	<.001	.073
Δ Model 2 →Model 3			19.71	<.001	.034

Note. The β values shown are standardised. Ward Gini coefficients and mean incomes (per person) were calculated from the Greater London Authority and 2011 census data. Assaults are those recorded by the London Ambulance Service per 1000 population per month, for the period April 2010 – March 2012, with assaults on women for that period deducted.

a. Standardised β coefficient

Figure 2.12

Scatter Plot Showing the Association Between Ward Mean Annual Income per Person (2010/2011) for 533 London Electoral Wards, and the Number of Assaults (Not on Women) per 1000 Population per Year (London Ambulance Service, April 2010 –March 2012) in Those Wards
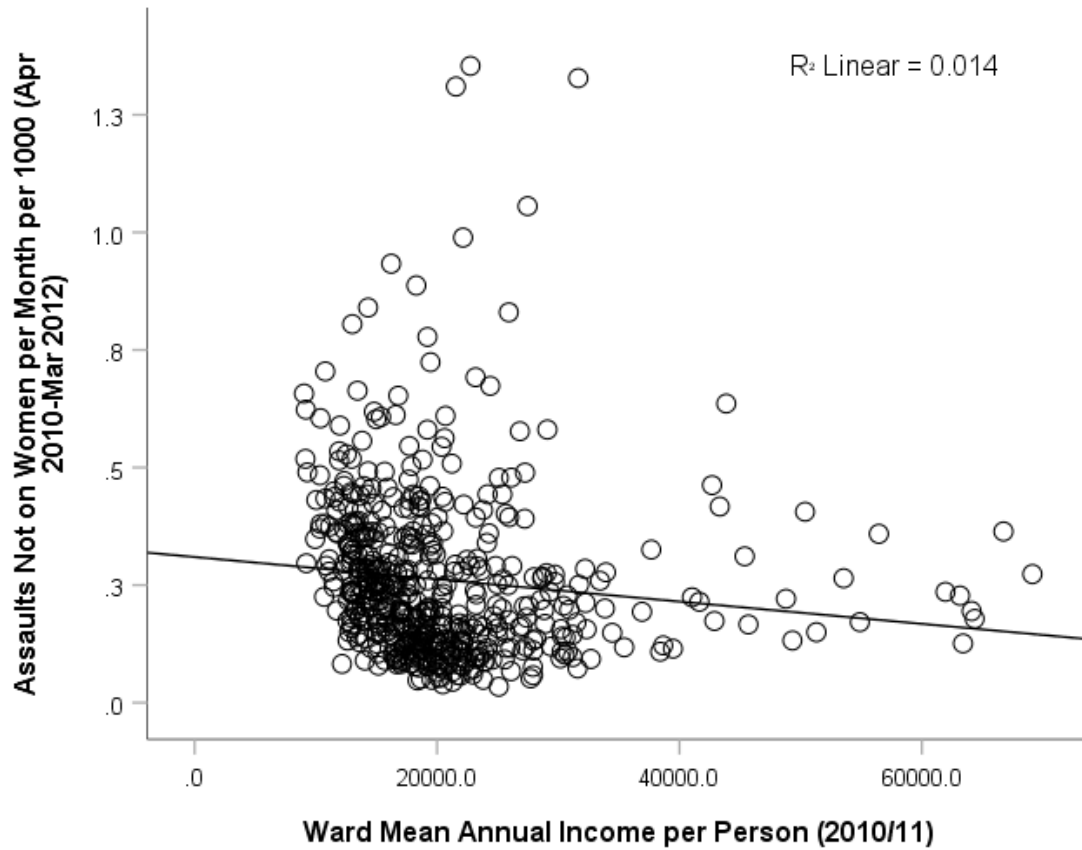
Figure 2.13

Scatter Plot Showing the Association Between Ward Gini (2010/2011) for 533 London Electoral Wards, and the Number of Assaults (Not on Women) per 1000 Population per Year (London Ambulance Service, April 2010 –March 2012) in Those Wards
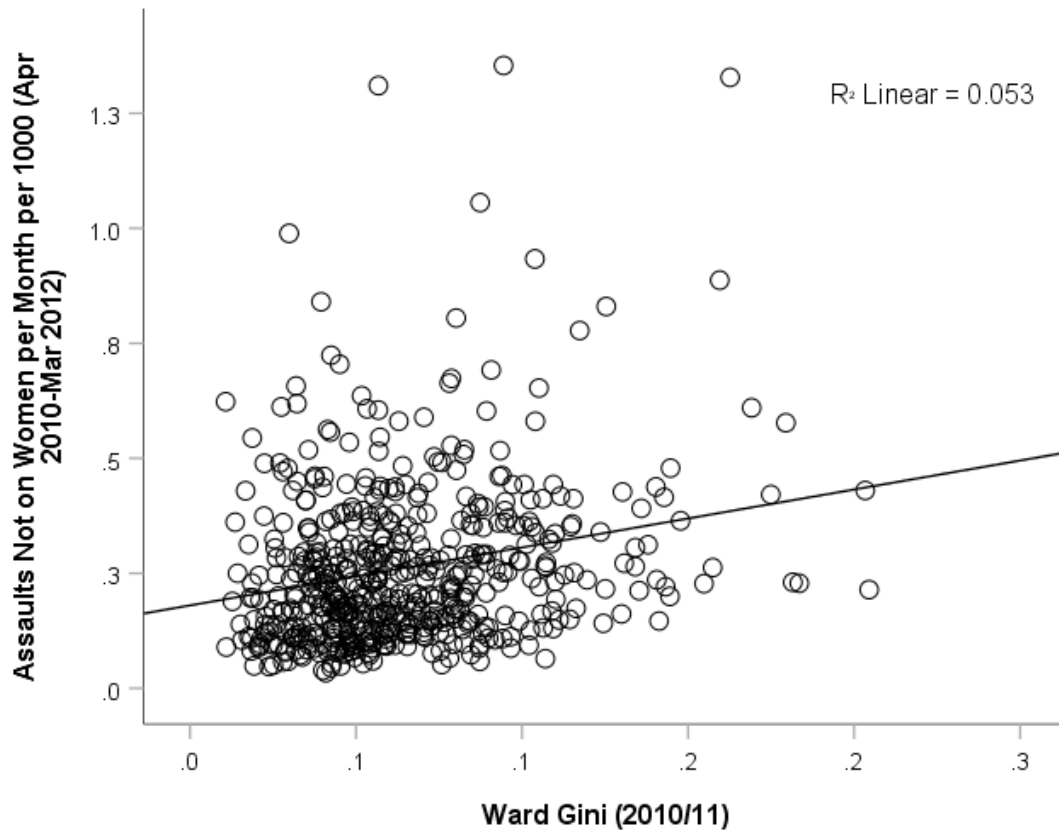
Figure 2.14

Partial Regression Plot Showing the Variance in Assaults (Not on Women) per 1000

Population per Year, (London Ambulance Service, April 2010 – March 2012) Explained by

Ward Gini (2010/2011) After Controlling for Mean Income per Person (2010/11)

(Unstandardized Residuals) For 533 London Electoral Wards
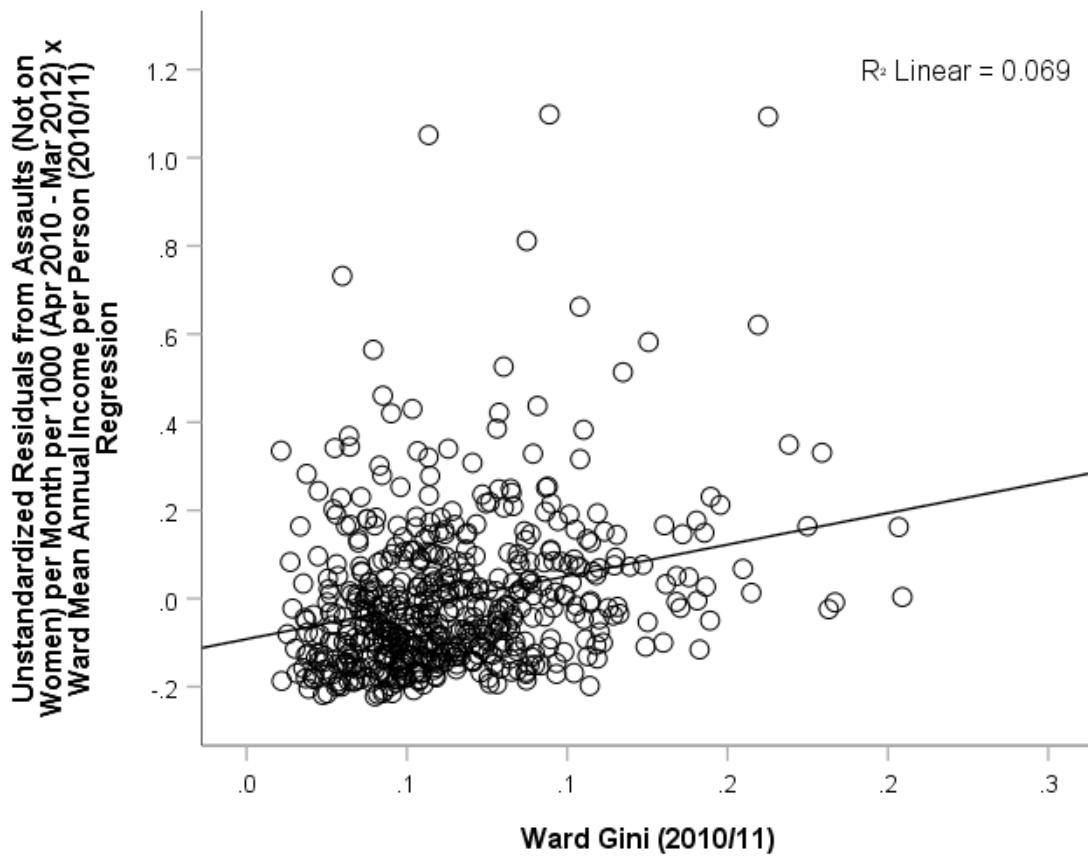
Figure 2.15

Partial Regression Plot Showing the Variance in Assaults (Not on Women) per 1000

Population per Year, (London Ambulance Service, April 2010 – March 2012) Explained by

Ward Mean Income (2010/11) After Controlling for Ward Gini Coefficients (2010/11)

(Unstandardized Residuals) For 533 London Electoral Wards
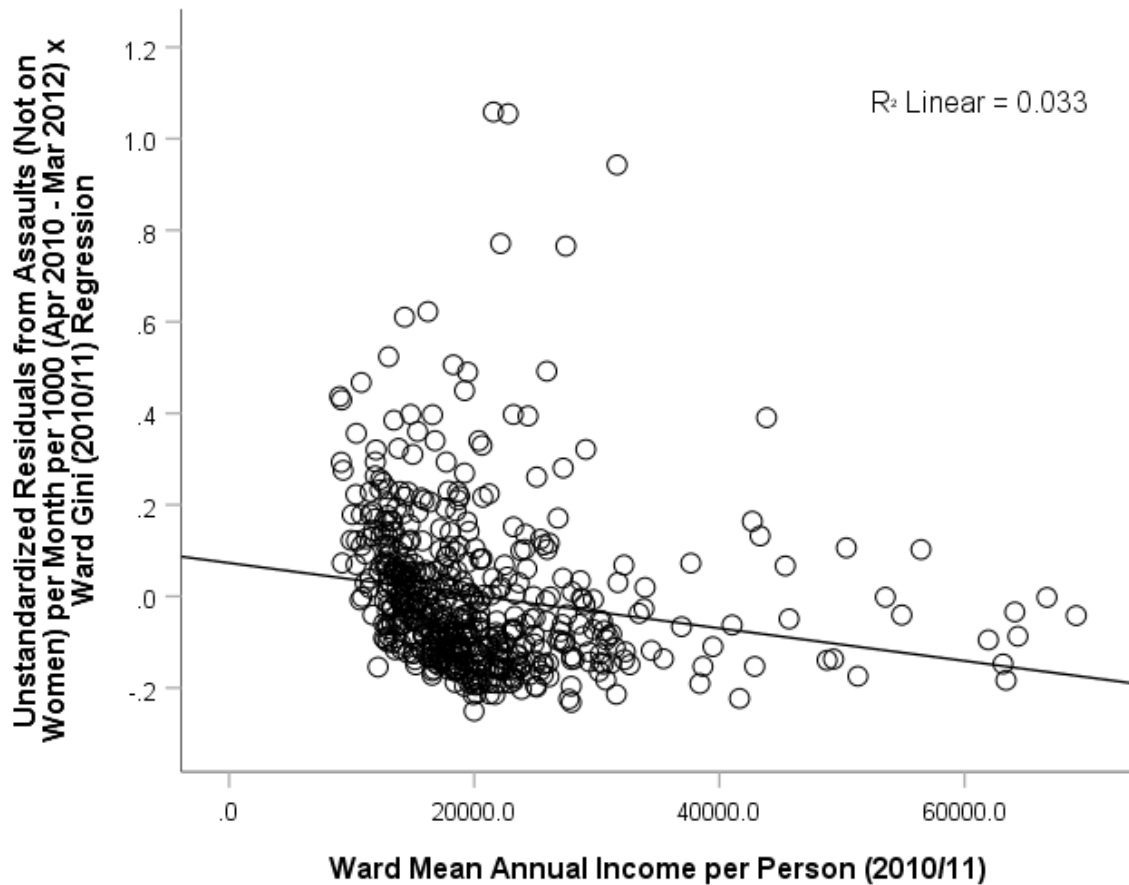
2.4. Discussion

The present study aimed to examine the association between economic inequality and interpersonal violence at a fine geographical scale in London. It was predicted that for the period 2010-2012, income inequality between Lower Super Output Areas (LSOAs) within each of London's electoral wards (measured by ward Gini coefficients based on 2010/2011 income data from the Greater London Authority, and 2011 census data) would predict the incidence of violence in those wards, over and above ward average income. This was investigated using two datasets; the London Ambulance Service recorded assaults, per 1000 people, per month; and the Metropolitan Police recorded violent crimes per 1000 people, per month.

Results were consistent with these predictions, showing significant associations between the income inequality measure, ward Gini, and measures of interpersonal violence in both datasets, which remained after controlling for mean income. As shown in Table 3, both ward mean income per person per year and ward Gini were significantly correlated with both measures of interpersonal violence. Mean income's relationship with both assault rates and violent crime rates was negative, indicating that as ward mean incomes increased, there was a general tendency towards lower rates of interpersonal violence. Gini's relationship with both measures of violence was positive, indicating a general tendency for wards with higher levels of inequality to also have higher rates of interpersonal violence.

A Pearson's test was carried out between Gini and mean income, to check for potential issues of autocorrelation. As previously discussed, higher inequality and poverty often come together, making it more difficult to determine whether any apparent associations between violence and inequality, could be explained by the poverty in areas with high income inequality. However, as shown in the results, Gini was in fact positively correlated with mean income ($r = .260$, $p < .001$). This pattern is similar to what was seen in the income data for Canadian Provinces in the study by Daly et al (2001), and indicates that there was a trend for poorer neighbourhoods to have more equality in income, and overall richer neighbourhoods to have higher inequality in income. This suggests that any positive correlations between income inequality and interpersonal violence measures in our data are unlikely to be an indirect result of an association between poverty and inequality.

Further support for income inequality as an independent predictor for interpersonal violence, was provided by the multiple regression analyses, showing both ward Gini and mean income to be significant independent predictors of both violent crime and assault rates. These results suggest that both levels of income inequality (as measured by ward Gini) and average income in an area, are important factors that contribute to levels of interpersonal violence; both explaining variance over and above the effects of the other. This is consistent with the previous research reviewed in the introduction to this study, also showing a significant relationship between inequality measures and violence measures results in other geographical areas. Results indicated that Gini may be a marginally better predictor of interpersonal violence.

As the present study was epidemiological, i.e. the analyses were conducted on pre-existing data that was not recorded with this specific study in mind, there were some issues that should be noted. It is important to note that despite the fine geographical resolution of the study, it is still somewhat aggregated. The fact that the ward Gini coefficients were based on LSOA average incomes rather than individual level data means that information would have been lost. However, it is more likely that this aggregation would lead to an underestimation of inequality rather than an overestimation. Moreover, there are potential issues with using Gini as a measure of inequality. In Kennedy et al's (1996) paper analysing the correlations between the Gini index and different mortality rates, only homicide was significant ($r = .28$, $p = .04$). Kennedy, et al (1996) explain that this difference in results is because the Gini index was most sensitive to the income at the extreme levels of the distribution. They argue that because the Gini index was highly correlated with the proportion of income earned by the bottom 10% of the population, that the Gini index acts as a measure of extreme deprivation. This would imply that it would not stand up as a significant predictor if it was analysed alongside more standard measures of poverty, but this is not the case, as found in the current and previous studies, Gini and measures of poverty have repeatedly been found to each contribute independent variation in homicide rates (such as in the current study, as well as in research by Gartner, 1990; and Krohn, 1976).

Kennedy et al's conclusion that Gini's only significant association with mortality rates being with homicide is because it is a measure of deprivation, would seem to be based on

the assumption that homicide and violence is driven only by deprivation. It is more logical to deduce that Gini acts as a measure of *relative* deprivation, which is entirely consistent with the theorised association between inequality and violence. These findings are suggestive that Gini is a type of inequality measure that is most sensitive to a particular type of inequality; one that reflects high levels of deprivation at the lower ends of the economic distribution relative to the majority of the population. Their found association with homicide is actually consistent with the theorised association between inequality and violence. Moreover, in Kawachi and Kennedy's later (1997) review comparing the relationship between mortality rates and different measures of inequality, their findings go on to suggest that Gini is an adequate measure of inequality. They investigated whether the relationship between inequality and mortality rates could depend on the kind of inequality measure used. They compared the Gini coefficient; the decile ratio; the proportions of total income earned by the bottom 50%, 60%, and 70% of households; the Robin Hood Index; the Atkinson Index; and Theil's entropy measure. Each measure was compared with measures of poverty (median income, and a poverty index indicating the amount of people below the federal poverty line) as predictors of mortality rates. In every analysis, it was found that all measures remained significant predictors of mortality rates (with r values ranging from .50 to .66). Pearson correlations between the measures of inequality showed that all were highly correlated with each other (r ≥ .94). This suggests that whilst these measures may differ slightly, and some may be suited to particular kinds of data or research, they are all on relatively equal footing and any one of these would be good measures to use when investigating the effects of inequality. Overall, the evidence indicates that ward Gini, as a measure of income inequality between neighbourhoods within each ward, was most likely a sufficient tool for analysing inequality in this study; future research could perhaps replicate the study with alternative measures of inequality.

Furthermore, the focus of this research was on male intrasexual competition, however there was no cross-tabulation in either the London Ambulance Service assault data, or the Metropolitan Police violent crime data, on the sex of the perpetrators. Although it is known that the majority of violent crimes are carried out by males (e.g. Daly & Wilson, 1990; Wilson & Daly, 1985), the lack of sex differentiation in the data means that one cannot be certain that the significant relationship between inequality, and interpersonal

violence in this study, is being driven by variation in male intra-sexual competition. However, further figures released by the London Ambulance Service on the number of assaults against women allowed for the creation of a sub-set of data that excluded assaults on women. Deducting these incidents from the assault rates data did not reverse the significance or direction of any of the results (see section 2.3.2.3). This results from the analysis on this dataset appeared to strengthen the case that Gini may be a better predictor for interpersonal violence, with a bigger disparity in statistics between the two predictors than in the previous two datasets.

There was no information on the proportion of instances involving females as perpetrators, or any other information on the sex or gender of those involved. However, males have repeatedly been found to account for the majority of cases, both as perpetrators and as victims of interpersonal violence (e.g. Daly & Wilson, 1990; Olding et al, 2019; Whittaker et al, 2017; Wilson & Daly, 1985). Furthermore, the fact that average income was associated with interpersonal violence is also indicative that it is those at the lower ends of the distribution that are involved in these assaults. This is consistent with previous research showing various measures of poverty to be associated with levels of violence; including NHS data from the West Midlands showing that a higher proportion of assault patients lived in poorer areas (Downing et al, 2003). Using the Townsend quintile, they showed that the age/sex standardised assault admission ratio for people living in the affluent quintile was 45.1 per 1000, whereas for those in the very deprived quintile it was 175.9 per 1000.

As explained by Daly (2017), individuals at the lower ends of the distribution are generally only direct competitors with each other, and have little to gain, other than increasingly severe punishment, from violent altercation with those at the top; "The most realistic chance of status gains – and the one in which one must be most vigilant in being taken down a peg – is the arena of competition among near equals.", (Daly, 2017, p. 101). Similarly, an individual who is already high in the socioeconomic distribution through less risky-means (inherited or otherwise), would have little to gain from being violent. The rich have other, less risky facilities at their disposal to help them to assert their position; as explained by Daly, "Violence has become the recourse of the poor largely because they don't have access to the law's protections and remedies in the same way as the rich.",

(2017, p. 101). It is unknown whether economic inequality affects cognition in a similar way to those in the higher echelons in society, or only those at the bottom. It is possible that those at the top are able to express this increased drive in more socially acceptable ways, i.e. in terms of engaging in riskier behaviour such as taking part in extreme sports. If more detailed demographic information on those involved in violence becomes available, this would be a valuable source for research looking to corroborate the findings.

Another limitation of the current study is that it does not take into account people's ability to travel. People are not confined to the Wards in which they live, and would have been able to commit crimes in Wards other than the one they are registered as living in according to the census. It is also important to note that it is not known whether the inequality they experience is confined to the one in which they are registered in, in the census data; people regularly commuting to different areas to work for example, can mean they are exposed with different levels of inequality or poverty to the areas in which they live. If the relationship between economic inequality and violence is due to changes in cognition as result of exposure to inequality, then it should be considered that individuals are not necessarily only exposed to the level of inequality in the area in which they live. Likewise, the level of poverty in one area compared to the level of poverty in a non-neighbouring area that an individual regularly commutes to, might also create a perception of inequality that would not be adequately captured in an analysis such as in the current study. Moreover, the geographical boundaries within the current study are relatively arbitrary; confining comparable areas to Wards, but not taking into account, for example, neighbouring LSOAs that may span different Wards. Using more sophisticated geospatial techniques to measure inequality is something that future research could attempt. Alternatively, asking individuals on their experiences of inequality could also address this issue.

Although there are limitations to the conclusions that can be drawn from this study, overall these results are *consistent* with the existence of an association between economic inequality and intra-sexual violence amongst men, and in turn, with the theory that it is associated with an increase in intrasexual male competition. Whilst the differences are marginal, it can be seen in tables 4, 5 and 6 that, adding ward Gini to a model with average income as a predictor for assault rates appear to have improved the model more than

adding average income to a model where Gini was a predictor of assault rates; a difference that only increased when assaults on women were removed from the dataset. This is indicative that inequality *may* have a stronger effect than average income on interpersonal violence (particularly in the case on male-intrasexual violence). However, these results must be interpreted with caution, particularly when considering the small differences, strengths of the associations, and the lack of significance test to compare the changes in R^2. Previous studies looking at larger areas have found similar results, showing inequality to be a better predictor of homicides than measures of poverty/affluence (e.g. Krohn, 1976; Wilson & Daly, 1997). This does not mean that we should discount poverty, it only bolsters the argument that inequality needs to be taken seriously as a factor contributing to violent crime, and as a driving factor for intra-sexual male competition and violence.

These results suggest that this association between economic inequality and violence can be seen even on as fine a geographical resolution as UK neighbourhoods. This contrasts with the results found by Patterson (1991), in which only poverty was found to be a significant predictor of violence when looking at neighbourhoods in the United States. It is possible that this could be due to the kinds of crimes that make up their dataset, which was comprised of aggravated assaults, as well as robberies and rapes. The Metropolitan Police data for violent crimes are comprised of assault with injury, common assault, harassment, homicide, offensive weapon, wounding/GBH, and other types of violence (Metropolitan Police, n.d, Crime Type Definitions). The Metropolitan Police dataset *may* have been more representative of incidents driven by male intrasexual competition, but this is merely speculative. This argument concerning the nature of crimes included in the dataset cannot be made in the case of Messner and Tardiff's (1986) study, which found homicide rates to be significantly predicted by the proportion of those in poverty, but not by neighbourhood gini. It could be argued that 'the proportion of those in poverty', as a measure, merely represents an alternative measure of inequality. However, our results *are* consistent with the Chicago study by Wilson and Daly (1997), which although had decreased spatial resolution compared to the present study, was similar to the studies by Patterson (1991), Messner and Tardiff (1986) in that they were also looking at neighbourhoods in the US.

Finally, it is important to note that the present study does not shed any light on the role of culture in violence. However, any role that culture may play, does not deduct from

the importance that inequality clearly plays. How culture may interact with inequality could be a topic for investigators to look at in future research.

2.4.1. Conclusion

Successfully finding support for this relationship between inequality and interpersonal, (mostly) non-lethal violence at such a fine geographical resolution, is not only novel, but extremely valuable information. It brings us closer to considering what may be happening at the individual level. Theoretically, it should be easier to perceive inequality on a local level than, for example, a national or global level. Albeit, this was more likely to be the case before the internet enabled such fluid communication unlimited by geography. It is not clear whether at this point in time local inequality is more or less important in regard to affecting individual cognition and behaviour. How inequality is perceived at the individual level and the cognitive changes that occur, is an important avenue for future research, to enable the creation of fully informed interventions, and ultimately, improve quality of life for individuals. This is what the subsequent chapter focuses on.

3. Chapter 3:   Study 2 - Perceptions of inequality and psychological risk factors for

violence

3.1. Introduction

3.1.1. Introduction

Study 1 looked at the relationship between economic inequality and recorded levels of violent crime across small scale neighbourhoods in London. It showed a tendency for areas with higher income inequality to have higher levels of recorded violence; as measured by two independent data sources. These results provided further evidence that there is a positive association between economic inequality and violence; an association that has been documented in many other contexts (e.g. for a review see Daly, 2017). Moreover, the study demonstrated that this relationship can be observed at a much finer geographical resolution than has previously been investigated.

When considering the relationship between the experiences of individuals and involvement in violence, and looking at aggregate data, confounding factors can come into play, meaning any results need to be interpreted with caution. This is particularly important to consider in regard to studies that have looked at the relationship between inequality and violence across countries and cultures (e.g. Gartner, 1990; Krohn, 1976; Elgar & Aitken, 2011). Finding the existence of the association at such a fine resolution in Study 1, suggests that this may be reflected and observable at the individual level; in the form of an association between experiences of inequality and a tendency towards violent behaviour. Unlike aggregate data, individual level data arguably has greater potential to allow for investigation into what drives the association, and the proximate psychological mechanisms underlying it. It is possible to look at how their local experiences may shape the cognitive processes that drive the inequality-violence relationship seen in aggregate level data. The more detail we know about these processes, the more opportunities there are to intervene. The current study aims to investigate the underlying psychological mechanisms of this relationship with existing social science survey measures.

This new line of questioning into the association at the individual level requires a different approach compared to previous research. It must be considered how inequality acts a stimulus on an individual, to prompt the facultative changes that occur during

interpersonal interactions, that make violence more likely. For a person to respond to a specific aspect of their environment, they must on some level be able to perceive it; whether that be indirectly through environmental cues that occur as a result of inequality, or a direct, conscious observation. Measuring perceptions of inequality, rather than using a socioeconomic measure such as the Gini index, takes into account how the inequality in an environment is experienced by an individual, which could potentially be more relevant It is also more logistically viable than calculating a Gini coefficient for the neighbourhood of each participant tested, and being able to maintain sufficient variation in order to test for an association; as the Gini coefficient for everyone within a particular area would be identical. Even recruiting just 1 participant from a particular location would require the financial information of every other person residing there in order to calculate the Gini coefficient. Measuring perceptions of inequality allows for sufficient variation for statistical analyses, and is more logistically viable.

Investigating the presence of mechanisms that connect individual perceptions of inequality with the likelihood of committing a violent crime, has the potential to explain why we often see more violent crime in areas where there is more economic inequality (an association that has been demonstrated in several studies, e.g. Gartner, 1990; Kennedy, et al, 1996; Daly et al, 2001). Considering these previous findings, it might be expected that people who perceive their environment to be highly unequal to show a higher propensity for violence.

3.1.2. Local Versus National Inequality

The positive relationship between economic inequality and violent crime has been seen at various levels of geographical resolution, including the country level (e.g. Elgar & Aitken, 2011; Gartner, 1990), US state (e.g. Kennedy et al, 1996) or province level (e.g. Daly et al, 2001, at a city level in the US (e.g. Blau and Blau, 1982), and as shown by the first study in this thesis, at neighbourhood level in the UK. It is currently unknown at which geographical scale perceptions of inequality actually affect an individual's behaviour; i.e. whether it is the perception of large-scale inequalities in society that affects behaviour or the perception of local inequality (e.g. within a neighbourhood). The presence of the association between inequality and violent crime between wards in Study 1 suggests this could be at a reasonably fine geographical level, but it is highly unlikely to be limited to the

exact boundaries of LSOAs or Wards; people travel widely for work and other reasons, and are exposed to information about the affluence of people in society more widely through media depictions. This is consistent with comments made by Hauser and Norton (2017) that people may often appear to mis-perceive the level of inequality in their country due to an over-reliance on the local-cues they are exposed to. They cite evidence from studies showing that participants' perceptions of local inequality or personal local ranking predicted or reflected how much inequality they perceived to be in their country (Cruces, et al, 2013; Xu & Garand, 2010). Xu and Garand (2010) for example, showed that people who live in states with greater income inequality were more likely to believe there had been a large increase in income inequality in the United States over the last two decades.

The primary aim of the current study was to investigate the importance of local inequality on cognition and behaviour. However, as indicated by the Xu and Garand's (2010) findings on personal ranking, it is also important to consider one's position within the socioeconomic distribution. It is not currently known whether economic inequality affects every individual who perceives it, regardless of their social position, or if it only affects people who perceive themselves to be on the lower end of a steep socioeconomic hierarchy. It was therefore important to ensure that measurements of perceived economic inequality within the environment, and relative social position, were measured independently. The International Social Survey Programme (ISSP) includes such measures in the form of a choice of pictorial representations of the shape of the economic distribution within society (see *Figure 3.1*), as well as measures regarding personal social position, similar to the commonly used MacArthur Scale (Adler et al., 2000; 2007). This diagram-based question from the social inequality module of the 2009 International Social Survey Programme (ISSP, 2017, Q14, p13) was originally designed to investigate how perceptions of inequality differed between countries, for which the data has been used in studies investigating perceived inequality (Brunori, 2017; Hadavand, 2017; Niehues, 2014; Gimpelson & Treisman, 2018). Niehues (2014) used an average of participants diagram choices to create an averaged subjective Gini score for each country investigated (for an explanation of the calculation, see Gimpelson and Treisman, 2018). The total area of the figure represented the total population values for each country, and the area of each bar was used to represent the proportion of the population in each income class, allowing for

the calculation of a subjective Gini coefficient using the standard formula. This subjective Gini score was found to correlate with the proportions of the populations who thought that income differences were too large (r = .81), which Niehues believed to be an indicator that this diagram-based question was able to effectively measure people's perceptions of inequality. The personal social position questions in the 2009 ISSP (2017) are virtually identical to the commonly used MacArthur scale (Adler et al., 2000; 2007), which has been shown to vary according to other variables such as one's level of income, education, and neighbourhood satisfaction (Shaked et al, 2016).

The research so far has focussed on the easily quantified measure of 'income inequality', however it was considered that this may not be something that is generally explicitly perceived, but rather something that leads to various visible cues in the environment that in turn affect cognition. This is in line with Hauser and Norton's (2017) suggestion of the potential importance of 'local cues' on perceptions of inequality. Moreover, income is only one factor that can contribute to one's social status. Therefore, the ISSP questions were supplemented with exploratory questions to further investigate the potential underlying cognitive mechanisms of the relationship between relative social position and a propensity for violence. In an effort to use a potential indicator of status that would accounts for this discrepancy, reference was made to a study by Rustad (2016), which adapted a question from the Afrobarometer (2005, Q2b) regarding relative living conditions, in order to investigate inequality in Nigeria. Rather than asking participants from Nigeria to rate their living conditions compared to people in Kenya (as in the Afrobarometer, 2005, Q2b), Rustad (2016) asked Nigerians to rate their living conditions relative to other Nigerians. In an economically unequal environment, the resulting differences in living conditions are observable consequences to the people living in it. Living conditions could therefore potentially act as a visible cue for status in the absence of knowing a neighbour's exact income; and is potentially even a more accurate indicator of status. It accounts for individuals in the population who may have an inherited particular social position and quality of life, but do not necessarily have an income that reflects this (e.g. unemployed, or low earning adults at the beginning of their career, who come from higher status families). The question was adapted for the purposes of the current study to investigate participants perceptions of their relative living conditions, as well as their relative income. In line with

the main purpose of this study, which is to investigate whether perceptions of local or national inequality are best associated with a psychological risk factors for involvement in violence, these living condition and income questions were asked within the context of the UK, as well as for their local neighbourhood.

3.1.3. Social Position

A further important question to ask about the association between economic inequality and violence is whose cognition and behaviour is affected. As noted in the discussion for Study 1, evidence indicates that it is generally those at the lower ends of the socioeconomic distribution that are involved in violent crime (e.g. Study 1; Downing, et al, 2003). However, considering the independent significance of inequality as a predictor for violence (such as in Study 1), it is possible that inequality may affect everyone who perceives it, regardless of their place in the distribution. The increased level of competition caused by inequality, could potentially increase feelings of competitiveness in anyone who perceives it. The resources and support available to high socioeconomic status individuals may mean that although they appear to have a different behavioural phenotype, they may have similar cognitive profiles that are merely expressed differently. A richer person who is feeling as though they have their status threated by a similar status rival, has safer means of competing and asserting superiority over their peers at their disposal. A rich person feeling competitive and impulsive, can invest in some risky stocks or engage in an extreme sport; things that are simply inaccessible to the poor. Being physically violent would not be particularly useful. As explained by Daly, "Violence has become the recourse of the poor largely because they don't have access to the law's protections and remedies in the same way as the rich.", (2017, p. 101).

3.1.4. Current Personal Position Versus Familial Position

It is well established that there are critical periods of development that determine phenotypic pathways across species (e.g. see work by West-Eberhard on developmental plasticity in evolution, 2003, pp. 128-132). This is particularly well established in humans and has an entire field dedicated to it (developmental psychology). The brain goes through substantial changes during a person's development into adulthood, and the environment during this time can affect how this development takes place, which in turn affects cognition and behaviour. For example, children from low socioeconomic status backgrounds have

been found to have differences in neural processing even when controlling for cognitive performance (Hackman & Farah, 2009). Early life adverse experiences in women, such as separation from one's mother, frequent change of residence, and lack of paternal involvement, has been shown to be associated with earlier reproduction (Nettle et al, 2011). Early life socioeconomic deprivation is also known to been associated with teenage pregnancy (as reviewed by Dickins et al, 2012). Exposure to violence during youth is associated with cognitive changes and a predisposition for aggressive behaviour (e.g. as discussed in Mead et al, 2010; Ng-Mak, et al, 2004). Low socioeconomic status in childhood is also associated with violent behaviour in adulthood (e.g. see Dubow et al 2016). A study by Chowdry, et al (2011) indicated that it is circumstances and investments in education made relatively early in life (by age 11) that predicts educational attainment later on. It is therefore reasonable to expect that it is earlier life experiences that determine an individual's future pathway, or 'life strategy' (a concept discussed further in section 3.1.6, and also discussed within the context of socioeconomic deprivation and teen pregnancy by Dickins et al, 2012). The possibility that a proclivity for violence (as a result of inequality) may be determined by prior rather than current experiences, would be consistent with evidence suggesting that there may be a lag in the societal effects of inequality (Daly, 2017, pp. 151-152; Zheng, 2012). In order to investigate, *when* this proclivity for aggression in response to inequality might be formed, a further exploratory variable was included. The ISSP social position questions were hence amended to ask participants about both their current personal circumstances, and the family they grew up in.

3.1.5. A Propensity for Violence

In regard to investigating an individuals' propensity for violence, this can be measured in a number of ways. However, questions about involvement in real incidents of violent crime would be subject to social-desirability biases, and could negatively affect participants who had committed unreported crimes, as a result of their participation. In addition to the sensitivity of the topic, it would not be possible to guarantee confidentiality (should information ever be requested by the Police).

Griskevicius et al (2009), investigated sex differences in aggression using a short questionnaire about a hypothetical social scenario, involving someone of the same sex spilling a drink on them at a party, and not apologising. Participants had to indicate whether

they would be likely to respond in particular ways that varied in their level of aggression. When manipulating the sex of the 'audience' members at the party, it was found that men were more likely to choose directly aggressive responses when the incident was said to take place in front of males, compared to when it was said to be a female audience. No significant effect of audience was found for women. In another variant of the study, instead of changing the sex of the audience, Griskevicius et al (2009) then investigated the effects of competition and courtship motives by using additional vignettes to prime participants, prior to asking about the hypothetical party scenario. In this version, men chose more directly aggressive responses after being primed by the competition vignette compared to courtship or control vignettes. This was not the case for female participants. The importance of male-intrasexual competition shown in both experiments, is indicative of the suitability of this hypothetical scenario questionnaire, for the purposes of measuring aggressive tendencies in the present study. Furthermore, this same measure of aggression has since been used in other studies. Wyckoff and Kirkpatrick (2016) for example, used it to look at how self-esteem in different domains (such as self-perceived social inclusion, dominance, or mate value) are associated with aggression tactics, and how they differ between men and women. Although there were floor effects for aggression, after correcting for this with unbiased parameter estimates, they found that overall, men were more likely to choose directly aggressive responses than women. There was no between sex difference in indirect aggression. This was followed up by another two studies with manipulations to the mate value of the 'drink-spiller', but they again found that overall, men reported higher levels of direct aggression overall, and similar levels of indirect aggression to women. The higher incidence of direct aggression in men found in all of these replications further supports that it is a suitable instrument for measuring aggression in men related to intrasexual competition.

Using a measure that asks participants about hypothetical social situations has several advantages over asking for retrospective reports of criminal acts. Asking about hypothetical situations would not have legal implications for participants; allows for strict confidentiality; and in turn, makes participants more comfortable to divulge vital information, reducing social desirability effects on participants' answers. The hypothetical,

and familiar nature of the scenarios, means it is more easily relatable for a general population sample.

3.1.6. Consideration of Future Consequences

As well as directly measuring self-reported aggression, a cognitive trait that may be associated with violent behaviour was also measured in participants. This could provide valuable information regarding the nature of the relationship between inequality and violent crime.

Previous research has found associations between aggression or criminal behaviour and the extent to which one thinks about the future. Joireman et al (2003) found scores on the Consideration of Future Consequences scale (CFC) (Strathman et al, 1994), to be a significant predictor of Aggression-Hostility scores on the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ) (Zuckerman et al, 1993). They found the same association when using another measure of aggression, Buss and Perry's aggression questionnaire (1992). The questionnaire includes the sub-categories; hostility, anger, and physical aggression; all of which were found to be significantly correlated with CFC. Trommsdorf and Lamm (1980) found that juvenile offenders were less future oriented than non-offending juveniles; i.e. they spent less time doing things such as thinking or talking about the future, and when they did, the time frames were shorter. Mahler et al (2017) found that the extent to which one had 'aspirations' for the future was negatively associated with offending behaviour in juvenile offenders, both at baseline and one year later. However, this particular finding must of course be interpreted with caution due to the limitations that convictions have on an individual's future prospects, and the possibility that participants' answers could have been subject to social desirability effects.

Gordon and Egan (2011) used Barrat's Impulsiveness Scale (BIS-II, Patton et al., 1995) to look at various factors relating to impulsivity and their association with criminal behaviour. They found a significant association between violent convictions and the non-planning and motor facets of BIS, but not the attention facet. The non-planning and motor facets are conceptually very similar, i.e. the non-planning facet attempts to measure the extent to which they plan tasks carefully, whilst the motor facet is intended to measure the extent to which they act without thinking. The BIS may be a measure of impulsivity, but as well as being a time oriented related trait, one's consideration of future consequences

clearly has considerable conceptual overlap with impulsivity; i.e. Impulsiveness is to act quickly without much thought, whereas the consideration of future consequences is the extent to which one thinks about the future. Having relatively little consideration of future consequences could be argued to be a pre-requisite for impulsive actions to occur; whether that take the form of reduced time spent thinking about negative consequences, reduced perception of likelihood of their occurrence, or reduced perception of the impact it will have on subjective experience (reflecting a reduction in the weighting of future outcomes, i.e. future discounting). Concurrently, Gordon and Egan (2011) also measured the association with Eysenck's measure of impulsivity (Eysenck et al, 1985) and also found this to be significantly associated with violent convictions. Nagin and Pogarsky (2004) found that the extent to which one considers consequences before acting significantly predicted violent offending in a sample of approximately 12,000 adolescents across the US.

Furthermore, Pepper and Nettle (2017) discussed the association of low socioeconomic status (SES) with a present time orientation, investing less in terms of time, energy, effort, and finances for the future across multiple domains. Lower SES individuals invest less in their health (e.g. Lynch, et al, 1997); education (e.g. see Chowdry, et al, 2011); have higher rates of teen-pregnancies (e.g. Imamura et al., 2007); invest and save less financially for the future (e.g. Lea, et al, 1993; Lusardi, 2003), whilst incurring more debt (e.g. Lea, et al, 1993). Priming participants with visual cues of poverty in the lab has also been found to be associated with delay discounting behaviour (Liu, et al, 2012).

Including the investigation of consideration of future consequences in the present study also fits well within the context of the Life History Theory (LHT) framework from evolutionary theory, and a study by Kruger et al (2008) looking at time orientation. LHT relates to evolutionary trade-offs; i.e. when investment in one particular aspect of fitness necessitates lower investment in another aspect. Within the context of human psychology, LHT dictates that an individual's ecological context may influence the extent to which they follow a fast or slow life strategy (see Nettle & Frankenhuis, 2020 for an overview of LHT in evolutionary psychology versus biology). Fast life-strategies are high risk, high reward strategies employed out of necessity in unstable environments, whereas slow strategies are low-risk with lower rewards, employed in environments with more stability. A study by Kruger et al (2008) looked at whether the inclusion of time orientation can improve a model

looking at the association between socio-environmental factors (i.e. the stability of the environment) and interpersonal aggression (indicating a fast life-strategy) in a sample of young people. It was found that a focus on the present did mediate the relationship. The steep hierarchy created by economic inequality could arguably be considered as an 'unstable environment', in regard to the huge variability in reproductive success it creates for men. The consideration of this in conjunction with Kruger et al's (2008) findings, makes CFC an attractive candidate as a cognitive factor underlying the relationship between inequality and violence.

The case for including CFC in the current investigation is only be made stronger when considering the practical implications that violent behaviour has for the person committing it. Modern society dictates that violence is unacceptable (at least, according to those with the most social power), and governments use law and policing to sanction violent behaviour. For example, assault causing actual bodily harm carries a sentence of up to 5 years in prison (The Law Pages, n.d.). The main function of prison is to act as both a punishment and deterrent for criminal behaviour. Its effectiveness depends on a conscious and 'rational' cost-benefit form of decision making; and does not take the motivations or reasons for acting this way in the first place into account (e.g. see discussions on the topic by Burnett and Maruna, 2004). In regard to a 2-year study involving the interviewing of existing prisoners by Burnett (1992; as cited in Burnett et al, 2004), the most frequent reason for not wanting to re-offend was to avoid imprisonment. However, as noted by Burnett and Maruna (2004), despite the effectiveness on prison participants' *desire* to not reoffend, 62% of them actually reported acts of recidivism during the study. Unfortunately, despite the existence of sanctions on violent behaviour; violence continues to occur. The Crime Survey for England and Wales for the year ending March 2020, estimated a total of 1.2 million violent incidents against adults in the UK (ONS, 2021). As mentioned in Chapter 2, homicide and violent crimes causing injury cost the UK £1.8billion, £15.5billion respectively, according to the 2015/16 crime report (Heeks, et al, 2018, p. 7).

Taken together, these facts suggest that for those that do take part in violent crime despite the existence of criminal sanctions, cognition during situations that encourage violent behaviour may be oriented towards the social necessity to react to current threats to status, rather than any potential future criminal penalties. The efficacy of these measures

depends on people applying sufficient cognitive weight to a future possibility, at a time when they are likely to be experiencing serious threat to their fitness. It is not particularly useful for one to take the time to weigh up the potential consequences in these situations, and risk calming down and losing 'their nerve'. This would, as explained elsewhere in this thesis, actually be a riskier tactic in terms of evolutionary fitness. A slim chance of 'getting away with it', surviving, gaining status and access to mates, is a higher chance than no chance at all; which is what one might expect if they were to allow their status to be negatively affected.

3.1.7. Summary

To summarise, this second study investigated whether individuals' *perceptions* of socio-economic inequality in society and their neighbourhood predict scores on measures of psychological variables that may be risk factors for involvement in interpersonal violence – i.e. consideration of future consequences and self-reported tendencies for aggression. It was predicted that perceptions of higher inequality in society would be associated with greater tendency for interpersonal aggression in a hypothetical social situation, and lower scores on the CFC scale. Perceptions of lower socioeconomic standing were also predicted to be associated with higher aggression and lower CFC scores.

A range of measures were included, to examine on an exploratory basis their relationship with cognitive risk-factors for violence, including;, the relative importance of perceived local versus national inequality; perceived relative personal position within the socioeconomic distribution; perceptions of relative living conditions (as a potential cue for relative social position); perceptions of one's personal income relative to others; and present versus previous familial position in society. One exploratory question was to determine whether there is an interaction between inequality and social standing, so that those who perceived both higher inequality and lower personal social standing, also showed higher aggression scores relative to others. A second question was to explore whether perceptions of inequality were associated with lower CFC regardless of perceptions of personal social standing. These 'predictions' were made very tentatively; with the primary aim being to identify as to whether inequality and social standing appeared to have additive or interactive effects on cognition and behaviour (i.e. CFC and aggression).

3.2. Methods

3.2.1. Participants

Participants were recruited via advertisements on social media inviting them to participate in a study on "Economic Views & Lifestyle Choices" and providing a link to the questionnaire hosted on Qualtrics. Of the initial 263 participants that attempted to start the study, 193 participants went on to give their consent. The sample consisted of 62 males and 128 females, and 3 participants who did not report a gender. Participants were aged 18 – 64 (M = 29.00, SD = 12.74). Education level and employment status was reported by all remaining participants, and is shown in Tables 1 and 2 respectively. For each analysis, pairwise-deletion was used to deal with missing values.

Table 3.1

Highest Level of Education Completed by Participants

Education Level	Frequency (n)	Percentage (%)
Higher degree (e.g. PhD, MSc).	20	10.4
Degree level qualification (e.g. BSc, BA, or equivalent)	71	36.8
Higher educational qualification below degree level (e.g. PGCert, PGDip)	10	5.2
A-Levels or Highers	75	38.9
ONC / National Level BTEC	4	2.1
O-Level / GCSE / CSE	6	3.1
Other qualifications (inc. foreign quals below degree level)	5	2.6
No formal qualifications	2	1.0

Table 3.2

Participant Employment Status
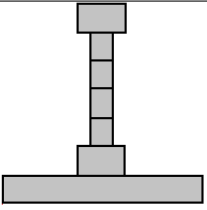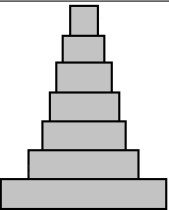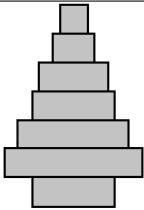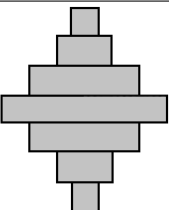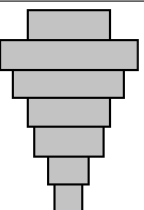
Employment status	Frequency (*n*)	Percentage (%)
Employed full time	65	33.7
Employed part time	22	11.4
Unemployed and currently looking for work	3	1.6
Unemployed and not currently looking for work	2	1.0
Student	83	43.0
Retired	2	1.0
Homemaker	1	0.5
Self-employed	14	7.3
Unable to work	1	0.5

3.2.2. Measures

3.2.2.1. Perception of Inequality and Social Position

In order to investigate perceptions of inequality at the local and national level, a choice of 5 diagrams from the International Social Survey, depicting different shapes of economic distributions were used (*Figure 3.1*). The International Social Survey has data available for annual surveys since 1985, in which social inequality had been investigated four times at the time of the current study (a fifth social inequality study has since been released for the year 2019). The diagrams from the social inequality module of the International Social Survey Program (ISSP, 2017, Q14, p13) were originally designed to investigate how perceptions of inequality in differed between countries, and has been used previously in other studies investigating perceived inequality (Brunori, 2017; Hadavand, 2017; Niehues, 2014; Gimpelson & Treisman, 2018). In those studies participants were asked "What type of society is <respondent's country> today - which diagram comes closest?"

Figure 3.1

Measure of Perceived Inequality

Type A	Type B	Type C	Type D	Type E
A small elite at the top, very few people in the middle and the great mass of people at the bottom.	A society like a pyramid with a small elite at the top, more people in the middle, and most at the bottom.	A pyramid except that just a few people are at the bottom.	A society with most people in the middle.	Many people near the top, and only a few near the bottom.

Note. Figure shows the diagrams used to measure perceived inequality, originally from the 2009 ISSP (2017, p13) from which participants choose the diagram that they believed most closely resembles the income distribution in the UK and their local area.

        As in the ISSP (2017) the 5 diagrams in Figure 3.1 were provided as possible answers for a question regarding which one they believed to be the closest representation of society, but with the necessary specification of looking at the UK today; "These five diagrams show different types of society. Please read the descriptions and look at the diagrams below. What type of society is the United Kingdom today? Which diagram comes closest?". Following this, the question was repeated with wording amended in order to investigate local inequality, rather than country-level inequality; phrased as

        "Now think about the local area where you live (i.e. your neighbourhood). These five diagrams show different types of neighbourhood. Please read the descriptions and look at the diagrams below. Which diagram most closely resembles your neighbourhood today?". The captions for each diagram were also amended accordingly to refer to "neighbourhood" rather than "society".

Participants' beliefs about their social position relative to others was assessed using two further questions from the ISSP (2017, Q10a, Q10b), answered using a 10-point numerical scale, and worded as follows:

"In our society there are groups which tend to be towards the top and groups which tend to be towards the bottom. Below is a scale that runs from top to bottom. Where would you put yourself now on this scale? (Please tick one box)" (ISSP, 2017, Q10a);

"And if you think about the family that you grew up in, where did they fit in then? (Please tick one box)" (ISSP, 2017, Q10b).

Lower answers closer to "1" represented lower social positions; whereas higher answers closer to "10" represented higher social positions.

In order to explore further explore the importance of present versus previous familial position at both a local and national level; as well as explore what factors individuals may use as indicators of relative social position, questions based on an item from the Afrobarometer (2005, Q2b) were used. The Afrobarometer is an international survey that has investigated public opinions on social, political and economic topics in African countries since 1999, which in 2019, is on its 7th round of surveys. The question regarding economic inequality from Round 3 of the Afobarometer surveys has since been included in papers by Rustad (2016), and Chang (2007). The question originally intended to measure participants perceptions of their living conditions relative to other Nigerians were adapted as follows for the current study:

"In general, how do you rate your income compared to those of other people in the UK?"

"In general, how do you rate your living conditions compared to those of other people in the UK?"

"In general, how do you rate your income compared to those of other people in your local area/neighbourhood?"

"In general, how do you rate your living conditions compared to those of other people in local area/neighbourhood?"

Answers for these questions were given on Likert scales ranging from 1("Much worse off"), to 5 ("Much better off").

3.2.2.2. Aggression

In order to measure the participants' likelihood of aggression in social situations, a self-report measure from Griskevicius et al (2009) was used (*Appendix C*), which has been shown to have good internal consistency (α = .78 - .80 for its 2 subscales, Griskevicius et al, 2009). It consists of a description of a social situation which participants are asked to imagine themselves in, where they are at a party and somebody from their class spills a drink on them and does not apologise; they are asked how much they would want to engage in a list of 8 behaviours (4 involving "Direct Aggression", and 4 involving "Indirect Aggression") on a scale from 1(not at all) to 9 (very much). The mean for the indirect aggression items was then calculated to attain an indirect aggression score; the same was done for the direct aggression items, and the overall aggression score.

3.2.2.3. Consideration of Future Consequences

Time perspective was measured via the Consideration of Future Consequences (CFC) scale (Strathman et al, 1994) (*Appendix D*). The CFC scale consists of 12 items which assess the extent to which an individual focuses on short-term or long-term consequences, and has been shown to have good internal consistency (α = .868, Strathman et al, 1994). Participants indicated how characteristic they believed each item to be of themselves via a Likert scale ranging from 1 (extremely uncharacteristic) to 6 (extremely characteristic), giving participants a score between 1 and 6 for each item. Of these 12 items, 7 were reverse scored (so that low agreement with the statement gave participants the full 6 points). The scores for each item were summed, giving each participant a CFC score, where a higher score indicates a higher consideration for future consequences, i.e. the extent to which an individual considers potential future consequences of their current behaviours.

3.2.3. Procedure

Ethical approval for this study was granted by Brunel University London College of Health and Life Sciences Research Ethics Committee (Reference: 7657-LR-Nov/2017- 8803-1; *Appendix E*). Participants were recruited via online advertisements to take part in a study investigating people's "economic views and lifestyle choices". After providing informed

consent online and given the opportunity to contact the investigators regarding any questions, participants completed the series of questionnaires hosted on Qualtrics. Participants were asked to provide demographic information, including their gender; age; ethnic group, education level, and employment status. These questions were followed by the questions regarding their perceptions of inequality and their social position as described above, which had been based on the Afrobarometer (2005, Q2b) and the 2009 ISSP (2017). This was followed by the CFC and aggression questionnaires, for which the order was randomised between participants to achieve counterbalancing. A debriefing form was then provided at the end of the questionnaire.

3.3. Results

3.3.1. Descriptive statistics

Descriptive statistics for the categorical variables are shown in Tables 3 and 4. Descriptive statistics for the numerical variables are shown in Table 5, including questions regarding social position, and scale statistics for the aggression and CFC questionnaires. Participants with missing values were excluded for that variable, resulting in varying sample sizes for each variable.

Table 3.3

The Frequency that Each UK Inequality Diagram was Chosen by Participants to Most Closely Represent the Shape of Society in the UK

Category	Description	Frequency	%
A	A small elite at the top, very few people in the middle and the great mass of people at the bottom.	29	15.2%
B	A society like a pyramid with a small elite at the top, more people in the middle, and most at the bottom.	58	30.4%
C	A pyramid except that just a few people are at the bottom.	40	20.9%
D	A society with most people in the middle.	58	30.4%
E	Many people near the top, and only a few near the bottom.	6	3.1%

Note. Response frequencies are shown for the diagrams chosen in response to the question, "These five diagrams show different types of society. Please read the descriptions and look at the diagrams below. What type of society is the United Kingdom today? Which diagram comes closest?". Diagrams can be seen in Figure 3.1.

Table 3.4

The Frequency that Each Neighbourhood Inequality Diagram was Chosen by Participants to Most Closely Represent the Shape of their Local Area

Category	Description	Frequency	%
A	A small elite at the top, very few people in the middle and the great mass of people at the bottom.	26	13.8%
B	A neighbourhood like a pyramid with a small elite at the top, more people in the middle, and most at the bottom.	29	15.4%
C	A pyramid except that just a few people are at the bottom.	24	12.8%
D	A neighbourhood with most people in the middle.	76	40.4%
E	Many people near the top, and only a few near the bottom.	33	17.6%

Note. Response frequencies are shown for the diagrams chosen in response to the question, "Now think about the local area where you live (i.e. your neighbourhood). These five diagrams show different types of neighbourhood. Please read the descriptions and look at the diagrams below. Which diagram most closely resembles your neighbourhood today?". Diagrams can be seen in Figure 3.1.

Table 3.5

Descriptive Statistics for Numerical Variables, Including Number of Participants with Valid Scores, Number of Scale Items, Scale Reliability, Score Range, Mean, and Standard Deviation

Numerical variables	Participants *n*	Items *n* (α)	Range	M (*SD*)
Aggression (Overall)	172	4 (.892)	1.00-9.00	2.46 (1.65)
Direct Aggression	172	4 (.877)	1.00-9.00	2.56 (1.94)
Indirect Aggression	172	4 (.875)	1.00-9.00	2.37 (1.76)
CFC	168	12 (.828)	24.00-60.00	41.79 (7.43)
Perceived personal position in society (ISSP)	183	1 (n/a)	1.00-10.00	5.73 (1.64)
Perceived family position in society (ISSP)	182	1 (n/a)	1.00-10.00	5.37 (1.93)
Rated income relative to others in UK (AB)	179	1 (n/a)	1.00-5.00	3.20(0.912)
Rated living conditions relative to others in UK (AB)	179	1 (n/a)	1.00-5.00	3.60 (0.825)
Rated income relative to others in neighbourhood (AB)	177	1 (n/a)	1.00-5.00	3.07 (0.819)
Rated living conditions relative to neighbourhood (AB)	179	1 (n/a)	1.00-5.00	3.23 (0.660)

Note. "ISSP" – International Social Survey Programme; "AB" – Afrobarometer.

3.3.2. Perceptions of UK inequality

As found by Bussolo, et al (2019) very few participants (≈ 3%) choose diagram E when asked about inequality in society. Consequently, as Bussolo et al did, and in order to retain power, the 6 participants that chose category E as the diagram most closely representing the UK's socioeconomic distribution (see Table 3) were excluded from the ANOVAs in which perceived UK inequality was a factor. This left a total of 191 participants. However, missing values for some dependent variables resulted in further exclusions; the resulting sample sizes are noted for each analyses. Scores for CFC, overall aggression, and its' subscales; indirect and direct aggression, all met required assumptions of normality.

The diagram chosen by participants (A, B, C, or D) was used as a categorical predictor in one-way ANOVA tests to determine whether views of inequality in society predicted either scores on the CFC scale, or the aggression scale and its subscales; direct and indirect aggression. There was no main effect of diagram chosen on Direct Aggression scores (Figure 3.2), $F(3, 163) = 0.822$, $p = .484$, $\eta p^2 =. 015$; Indirect Aggression scores (Figure 3.3), $F(3, 163) = .216$, $p = .885$, $\eta p^2 = .004$; Overall Aggression scores, $F(3, 163) = 0.325$, $p = .807$, $\eta p^2 = .006$; or CFC scores (Figure 3.4), $F(3, 160) = 2.19$, $p = .091$, $\eta p^2 = .039$;. Mean scores on each of the dependent measures for participants who chose diagrams A, B, C and D are shown in Figures 3.2 – 3.4.

Figure 3.2

Mean Direct Aggression Scores (±S.E.) for 167 Participants who Chose Diagrams A(n = 29), B(n = 52), C(n = 36), And D(n = 50) as Most Closely Representing the Socioeconomic Distribution in the UK (See Figure 3.1 For Diagrams A, B, C, And D)
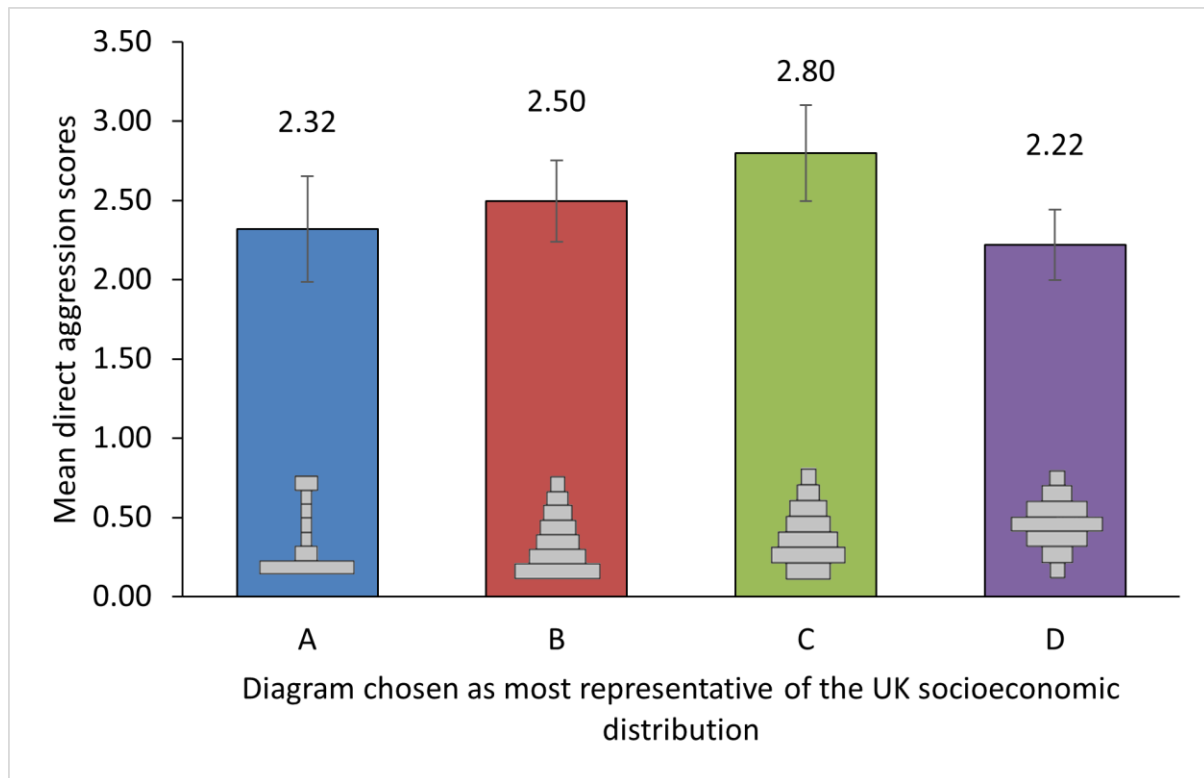
Note. No main effect of diagram choice for UK inequality was found on direct aggression scores, $F(3, 163) = 0.822$, $p = .484$, $\eta p^2 = .015$.

Figure 3.3

Mean Indirect Aggression Scores (±S.E.) for 167 Participants who Chose Diagrams A(n = 29), B(n = 52), C(n = 36), and D(n = 50) as most closely representing the Socioeconomic Distribution in the UK
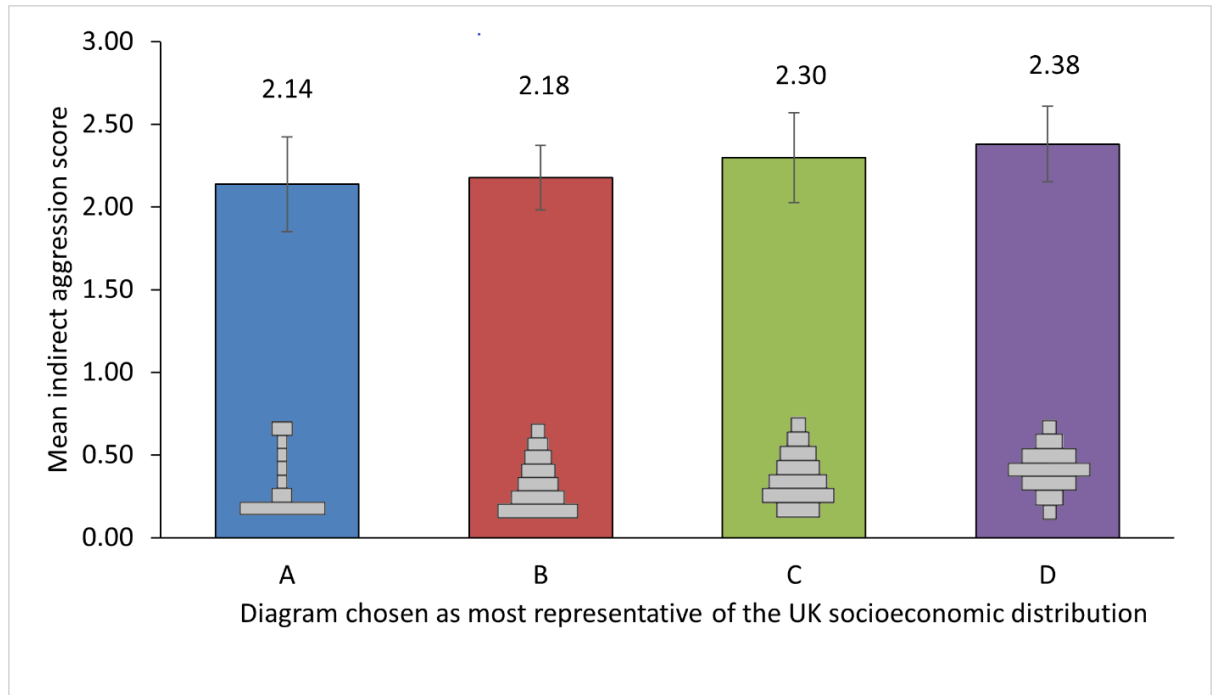
Note. No main effect of diagram choice for UK inequality was found on indirect aggression score, $F(3, 163) = 0.216$, $p = .885$, $\eta p^2 = .004$.

Figure 3.4

Mean CFC Scores (±S.E.) for 164 Participants who Chose Diagrams A(n = 27), B(n = 51), C(n = 35), and D(n =51) as Most Closely Representing the Socioeconomic Distribution in the UK
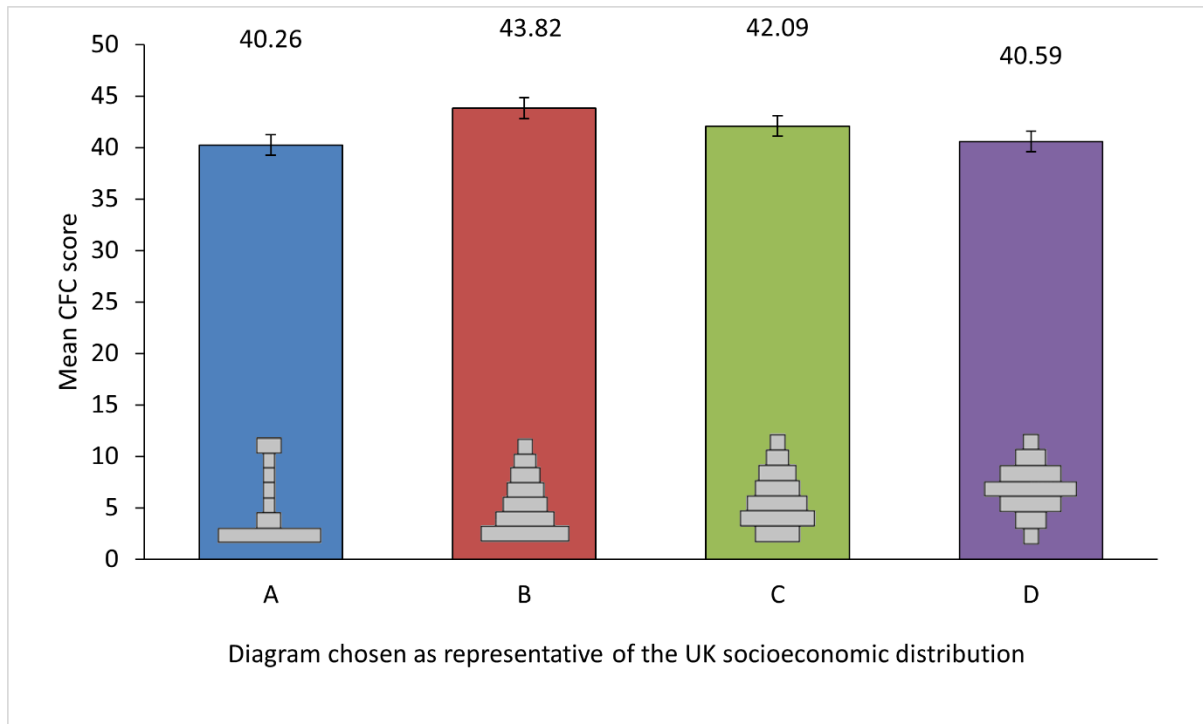
Note. No main effect of diagram choice for UK inequality was found on CFC score, $F(3, 160)$ = 2.19, p = .091, ηp^2 = .039.

3.3.3. Perceptions of local inequality

The diagram chosen by participants (A, B, C, or D) was used as a categorical predictor in one-way ANOVA tests to determine whether views of inequality in society predicted either scores on the CFC, or the aggression scale and its subscales; direct and indirect aggression. Scores for CFC, overall aggression, and its' subscales; indirect and direct aggression, all met remaining assumptions of normality. There was no main effect of diagram chosen on Direct Aggression scores (Figure 3.5), $F(4, 167)$ = 1.32, p = .263, ηp^2 = .031; Indirect Aggression scores (Figure 3.6), $F(4, 167)$ = 1.77, p = .137, ηp^2 = .041; Overall Aggression scores, $F(4, 167)$ = 1.635, p = .168, ηp^2 = .038; or CFC scores (Figure 3.7), $F(3, 160)$ = 2.19, p = .091, ηp^2 = .039;. Mean scores on each of the dependent measures for participants who chose diagrams A, B, C and D are shown in Figures 3.5 – 3.7.

Figure 3.5

Mean Direct Aggression Scores (±S.E.) for 172 Participants who Chose Diagrams A(n = 24), B(n = 27), C(n = 20), D(n = 73) and E(n = 28) as Most Closely Representing the Socioeconomic Distribution in their Local Area
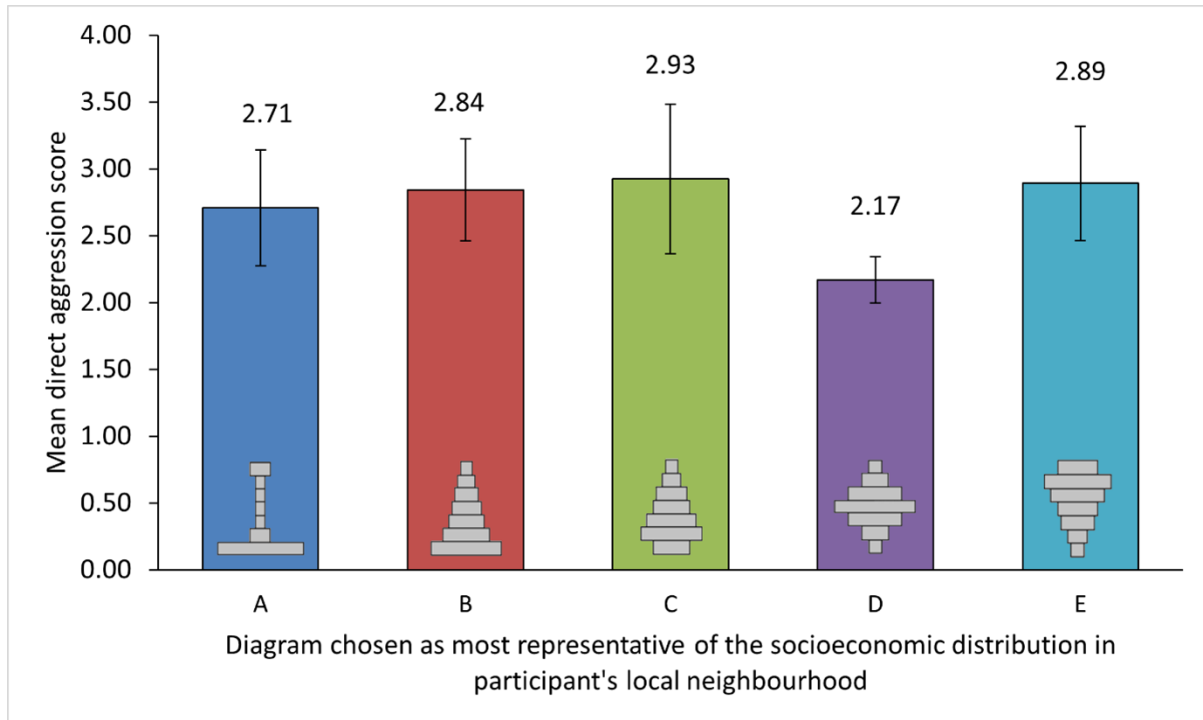
Note. No main effect of diagram choice for local inequality was found on direct aggression score, $F(4, 167) = 1.32$, $p = .263$, $\eta p^2 = .031$.

Figure 3.6

Mean Indirect Aggression Scores (±S.E.) for 172 Participants who Chose Diagrams A(n = 24), B(n = 27), C(n = 20), D(n = 73) and E(n = 28) as Most Closely Representing the Socioeconomic Distribution in their Local Area
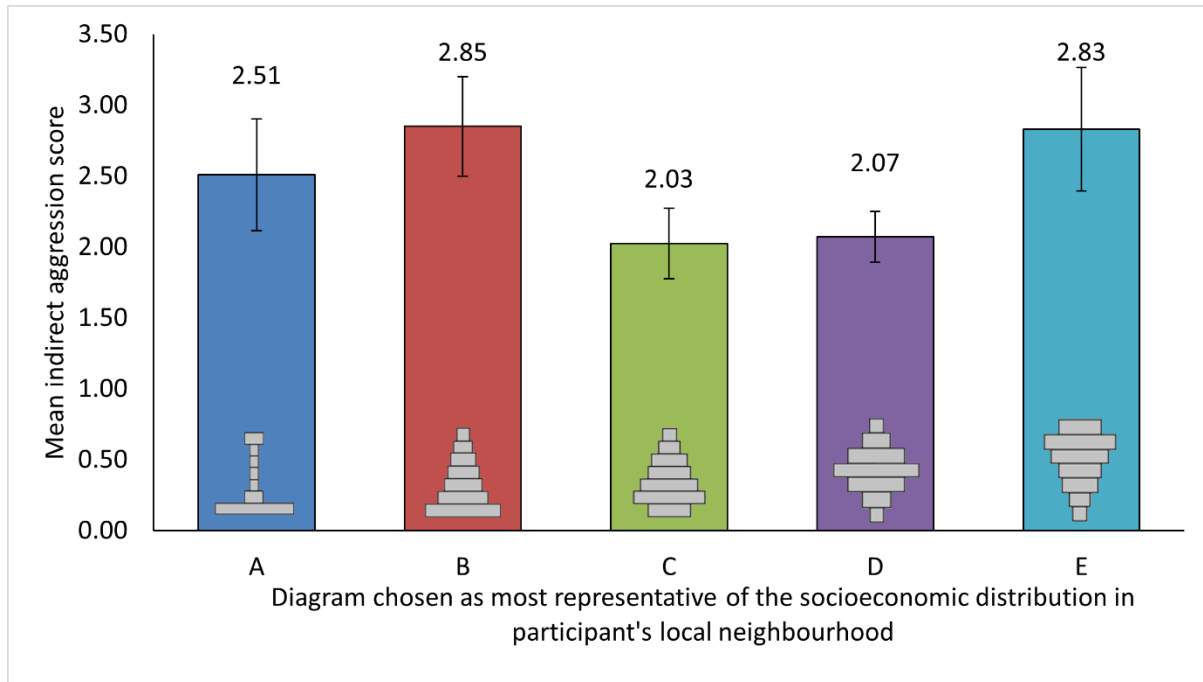
Note. No main effect of diagram choice for local inequality was found on indirect aggression score, $F(4, 167) = 1.77$, $p = .137$, $\eta p^2 = .041$.

Figure 3.7

Mean CFC Scores (± S.E.) for 168 Participants who Chose Diagrams A(n = 22), B(n = 27), C(n = 20), D(n = 72) and E(n = 27) as Most Closely Representing the Socioeconomic Distribution in their Local Area
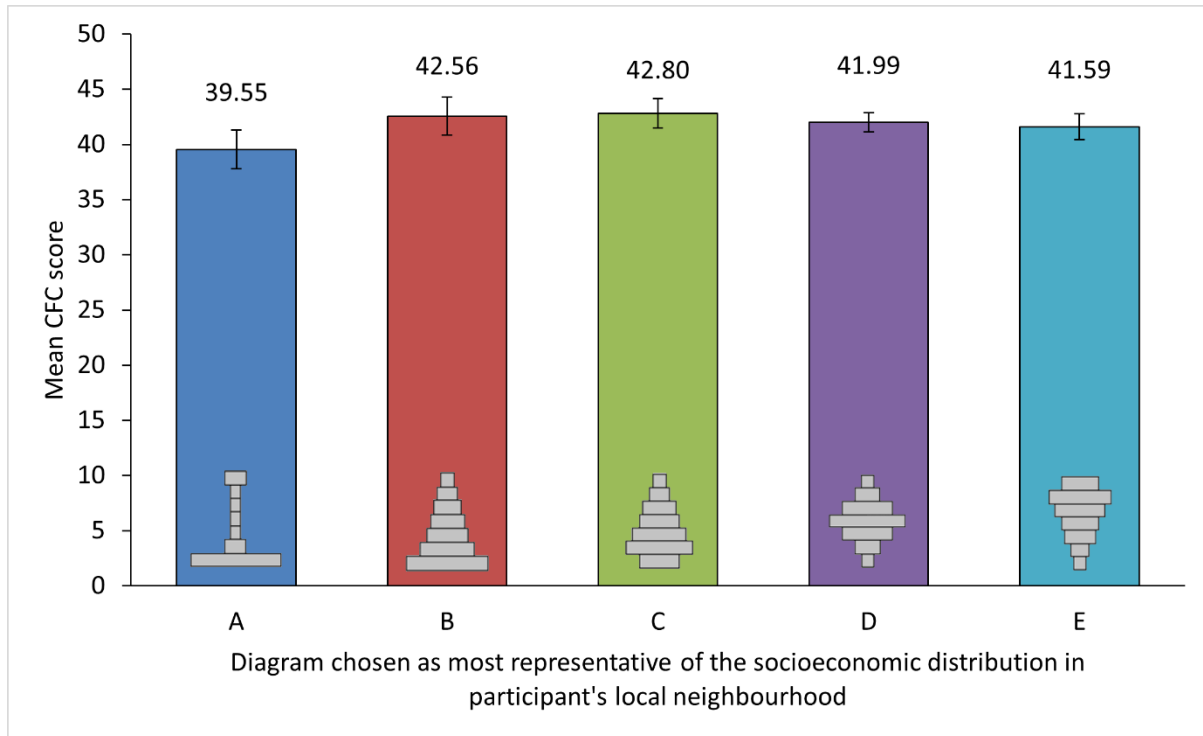
Note. No main effect of diagram choice for local inequality was found on CFC score, $F(4, 163) = .679$, $p = .608$, $\eta p^2 = .016$.

3.3.4. Perceptions of personal social position and proclivity for aggression

Table 3.6 shows bivariate associations using Spearman's rho (due to the ordinal nature of some variables) for the various measures of perceived personal social position, CFC, and aggression scores; including its direct and indirect subscales. No significant associations were found between any measures of social position and the CFC or aggression scores. CFC was not significantly associated with any variable, including an absence of association with overall, r_s (165) = -.079, p = .308, direct, r_s (165) = -.040, p = .607 or indirect aggression, r_s (165) = -.119, p = .127. The aggression subscales were significantly associated with each-other, r_s (170) = .537, p < .001.

Table 3.6

Bivariate (Spearman's rho) Associations Between Perceptions of Personal Social Position, Aggression and CFC Scores

	Overall aggression r$_s$(p)	Direct aggression r$_s$(p)	Indirect aggression r$_s$(p)	CFC r$_s$(p)
Perceived personal position in society (ISSP)	-.112(.114) n=172	-.132 (.084) n=172	-.081(.290) n=172	.073(.350) n=168
Perceived family position in society (ISSP)	-.054 (.479) n=172	-.094 (.220) n=172	-.019(.805) n=172	.042(.586) n=168
Rated income relative to others in UK (AB)	-.082(.228) n=172	-.119(.120) n=172	.017(.830) n=172	-.003(968) n=168
Rated living conditions relative to others in UK (AB)	-.075(.326) n=172	-.073(.344) n=172	-.037(.630) n=172	.007(9.30) n=168
Rated income relative to others in neighbourhood (AB)	-.094(.222) n=171	-.106(.167) n=171	-.052(.503) n=171	-.080(.306) n=167
Rated living conditions relative to others in neighbourhood (AB)	.110(.149) n=172	-.123(.109) n=172	-.114(.138) n=172	-.116(.113) n=168

Note. "ISSP" – International Social Survey Programme; "AB" – Afrobarometer.

Table 3.7

Bivariate (Pearson's) Associations Between Aggression and CFC Scores

	Direct aggression $r(p)$	Indirect aggression $r(p)$	CFC $r(p)$
Overall aggression	.903(< .001) n=172	.882(< .001) n=172	-.129(.097) n=167
Direct aggression	-	.594(< .001) n=172	-.097(.211) n=167
Indirect aggression	-	-	-.133(.088) n=167

3.3.5. Post-hoc exploratory analyses

3.3.5.1. Local versus UK perceptions of inequality

Further analyses were carried out in order to investigate whether perceptions of one's local socioeconomic distribution are associated with the same perception of the UK socioeconomic distribution.

Frequency statistics on the number of individuals who chose each category for local and UK socioeconomic distributions showed there was no clear association between UK and local diagram choices (Table 8). Category B was the modal choice for the UK distribution by participants who chose the local distribution to look most like categories A(n = 13), and B(n = 11). Category D was the modal choice for the UK socioeconomic distribution by those who chose their local distribution to look most like categories C(n = 13), D (n = 25), and E(n = 15).

Table 3.8

The Frequency that Participants Chose Diagrams A, B, C, D, and E as Best Representing the UK Socioeconomic Distribution According to the Diagram Chosen as Best Representing Their Local Neighbourhood Socioeconomic Distribution

	Diagram choice for participant local socioeconomic distribution				
	A	B	C	D	E
Diagram choice for UK socioeconomic distribution					
A	5	8	4	11	1
B	13	11	6	21	6
C	3	7	1	19	8
D	3	2	13	25	15
E	2	1	0	0	3

Note. A heat map is used here to highlight the differences in frequencies, with darker colours representing higher frequencies.

3.3.5.2. *Associations between perceptions of socioeconomic distributions and measures of*

perceptions of personal social position

    3.3.5.2.1. Associations between perceptions personal social position and perceptions of

UK inequality

       Further analyses were carried out to investigate whether perceptions of personal

social position are associated with different perceptions of the UK socioeconomic

distribution (see Table 8 for descriptive statistics).

Table 3.9

Descriptive Statistics for Measures of Personal Social Position for Participants who Chose Categories A, B, C, and D as Most Closely Representing the UK Socioeconomic Distribution

	Diagram chosen as most closely representing UK inequality			
	Diagram A *M(SD)*	**Diagram B** *M(SD)*	**Diagram C** *M(SD)*	**Diagram D** *M(SD)*
Perceived personal position in society (ISSP) (1=high, to 10=low)	4.90 (1.86) n=29	5.67 (1.38) n=55	5.75 (1.27) n=36	6.19 (1.52) n=57
Perceived family position in society (ISSP) (1=high, to 10=low)	5.28 (1.67) n=29	4.70 (1.97) n=54	5.58(1.56) n=36	6.07(1.79) n=57
Rated income relative to others in UK (AB) (1=much better, to 5=much worse)	2.93(.923) n=29	3.36(.901) n=53	2.97(.878) n=36	3.21(.847) n=56
Rated living conditions relative to others in UK (AB) (1=much better, to 5=much worse)	3.41(.825) n=29	3.66(.831) n=53	3.64(.683) n=36	3.62(.799) n=56
Rated income relative to others in neighbourhood (AB) (1=much better, to 5=much worse)	3.07(.593) n=29	3.13(.878) n=53	2.89(.832) n=35	3.13(.747) n=55
Rated living conditions relative to others in neighbourhood (AB) (1=much better, to 5=much worse)	3.31(.660) n=29	3.30(.749) n=36	3.06(.532) n=36	3.27(.522) n=56

Category chosen as best representing the UK socioeconomic distribution was found to be significantly associated with perceived general personal position in society, $F(3, 173) = 4.88$, $p = .003$, $\eta p^2 = .078$, driven by a significant difference between categories A($M = 4.90$, $SD = 1.86$), and D($M = 6.19$, $SD = 1.52$), $p = .001$. No other significant differences between categories were found (all $p \geq .13$).

Category chosen as best representing the UK socioeconomic distribution was found to be significantly associated with perceptions of previous family position in society, $F(3, 172) = 5.59$, $p < .001$, $\eta p^2 = .089$, driven by a significant difference between categories B($M = 4.70$, $SD = 1.97$), and D($M = 6.07$, $SD = 1.79$), $p < .001$. No other significant differences between categories were found (all ps $\geq .13$).

Category chosen as best representing the UK socioeconomic distribution was not found to be significantly associated with ratings of personal income relative to others in the UK, $F(3, 170) = 2.16$, $p = .095$, $\eta p^2 = .037$; with ratings of personal living conditions relative to others in the UK, $F(3, 170) = 0.69$, $p < .562$, $\eta p^2 = .012$; with ratings of personal income relative to others in local neighbourhood, $F(3, 168) = 0.85$, $p < .468$, $\eta p^2 = .015$; or with ratings living conditions relative to others in local neighbourhood, $F(3, 170) = 1.38$, $p < .250$, $\eta p^2 = .024$.

3.3.5.2.2. Associations between perceptions of personal social position and perceptions of local inequality

Further analyses were carried out to investigate whether perceptions of personal social position are associated with different perceptions of one's local socioeconomic distribution (see Table 3.10 for descriptive statistics).

Table 3.10

Descriptive Statistics for Measures of Personal Social Position for Participants who Chose Categories A, B, C, and D as Most Closely Representing One's Local Socioeconomic Distribution

	Diagram chosen as most closely representing local inequality				
	Diagram A *M(SD)*	Diagram B *M(SD)*	Diagram C *M(SD)*	Diagram D *M(SD)*	Diagram E *M(SD)*
Perceived personal position in society (ISSP) (1=high, to 10=low)	4.84 (1.65) n=25	5.38 (1.84) n=29	6.09 (1.24) n=23	5.75 (1.36) n=75	6.48 (1.98) n=31
Perceived family position in society (ISSP) (1=high, to 10=low)	4.68 (1.97) n=25	5.11 (2.22) n=28	5.70(1.74) n=23	5.40 (1.69) n=75	5.84(2.22) n=31
Rated income relative to others in UK (AB) (1=much better, to 5=much worse)	3.08(.812) n=25	2.82(.905) n=28	3.09(.900) n=23	3.27(.890) n=56	3.57 (.958) n=28
Rated living conditions relative to others in UK (AB) (1=much better, to 5=much worse)	3.20(.957) n=25	3.39(.832) n=28	3.61(.783) n=23	3.61(.715) n=75	4.11 (.786) n=28
Rated income relative to others in neighbourhood (AB) (1=much better, to 5=much worse)	3.32(.945) n=25	3.11(.934) n=27	3.23(.528) n=22	2.99(.707) n=75	2.93 (1.02) n=28
Rated living conditions relative to others in neighbourhood (AB) (1=much better, to 5=much worse)	3.36(.860) n=25	3.14(.848) n=28	3.26(.449) n=23	3.19(.538) n=75	3.29 (.713) n=28

Note. "ISSP" – International Social Survey Programme; "AB" – Afrobarometer.

Category chosen as best representing one's local socioeconomic distribution was found to be significantly associated with perceived general personal position in society, $F(4, 178) = 4.37$, $p = .002$, $\eta p^2 = .089$. Perceived personal social position for those who chose diagram A ($M = 4.84$, $SD = 1.65$), was significantly better than those who chose diagrams C($M = 6.09$, $SD = 1.24$), $p = .007$; D($M = 5.75$, $SD = 1.36$), $p = .014$; and E($M = 6.48$, $SD = 1.98$), $p < .001$. Those who chose diagram E($M = 6.48$, $SD = 1.98$) also perceived themselves as being significantly lower in society compared to those who chose diagrams B ($M = 5.38$, $SD = 1.84$), $p = .008$; and D($M = 5.75$, $SD = 1.36$), $p = .031$. No other significant differences between categories were found (all $ps \geq .11$).

Category chosen as best representing one's local socioeconomic distribution was found to be significantly associated with ratings of personal income relative to others in the UK, $F(4, 174) = 2.77$, $p = .029$, $\eta p^2 = .060$, driven by significantly better ratings by those who chose diagram B($M = 2.82$, $SD = .905$), relative to those who chose diagram E($M = 3.57$, $SD = .959$), $p = .020$. No other significant differences between categories were found (all $p \geq .20$).

Category chosen as best representing one's local socioeconomic distribution was found to be significantly associated with ratings of living conditions relative to others in the UK, $F(4, 174) = 4.97$, $p = .001$, $\eta p^2 = .103$. People who chose category E($M = 4.11$, $SD = 7.86$), as best representing the local socioeconomic distribution rated themselves as having significantly poorer living conditions (relative to others in the UK) than those who chose diagrams A($M = 3.20$, $SD = .957$), $p < .001$; B($M = 3.39$, $SD = .832$), $p = .009$; and D($M = 3.61$, $SD = .715$), $p = .041$. No other significant differences were found (all $ps \geq .18$).

Category chosen as best representing the UK socioeconomic distribution was not found to be significantly associated with previous family social position in society, $F(4, 177) = 1.57$, $p = .183$, $\eta p^2 = .034$; income ratings relative to others in one's local neighbourhood, $F(4, 172) = 1.21$, $p = .308$, $\eta p^2 = .027$; ratings of living conditions relative to others in one's local neighbourhood, $F(4, 174) = .502$, $p = .735$, $\eta p^2 = .011$.

3.4. Discussion

The current study's primary aim was to examine whether perceptions in inequality in society as a whole, or at the neighbourhood level, predicted scores on measures of psychological risk factors for violence. Moreover, it sought to elucidate any differential effects of perceived inequality at a national and local level, and an individual's perceived relative position within that distribution. Contrary to predictions, differences between participants in their perceptions of the shape of the socioeconomic distribution in the UK or participants' neighbourhoods (see *Figure 3.1*) were not associated with any differences in scores on the measures of aggression (see *Figures 3.2* & *3.3*) or consideration of the future (CFC scale; see *Figure 3.4*). There was also no evidence of any associations between perceptions of personal relative social position and self-reported aggressiveness or CFC; this was the case for perceptions of current and previous familial position; as well as for indicators of position; relative income and living conditions. The lack of associations between aggression with either perceptions of inequality in society or perceived personal social position are inconsistent with much epidemiological research showing associations between economic inequality and violent crime (for a review see Daly, 2017); an association that was replicated in Study 1 of this thesis.

It is possible that the reason no associations were found with perceptions of either national or neighbourhood inequality, was because the inequality diagrams were difficult for participants to interpret. Whilst previous research has been able to attribute inequality values (e.g. Gini coefficients) to diagrams like these (Niehues, 2014; Gimpelson & Treisman, 2018), for participants viewing them it is not necessarily immediately apparent which diagrams could be considered more or less equal than the others. This is consistent with Gimpelson and Treisman's (2018) findings that participants accuracy in diagram choices that most closely represented their country's economic distribution, accuracy was relatively low. If this was the case, any existing associations between perceptions of overall inequality and aggression would be hidden by the varied interpretations of the diagrams. In basic terms, higher inequality is a larger economic difference between the rich and the poor. The ISSP inequality diagrams represent the number of people in each of 7 income classes from the poorest at the bottom, to the most affluent at the top. However, determining how big an economic difference there is between these stages may be difficult to conceptualise. As the

income difference between each 'step' in the pictorial distributions are not specified, there is no way of knowing whether participants interpret them in the way they were intended. For example, there is no particular reason to believe that participants would perceive a linear increase between each income 'step', or something more similar to an exponential increase.

This is inconsistent with the finding by Niehues (2014) that subjective Gini scores calculated from aggregated diagram choices significantly correlated with the proportion of the population that believed income differences were too large. However, it is important to consider that the subjective Gini scores in Niehues' study were intended to represent not individual perceptions, but an 'average' of perceptions for the inhabitants of each country. This would not reflect any multimodal patterns within the population. For example; in a country where 50% of the population perceive most people to be relatively rich, with only a few poorer people, and the other 50% believe most people to be relatively poor, with only a few richer people, the average would result in a perceived distribution that looks nothing like either group's views. Whilst the current study does not attempt to aggregate views of inequality; the use of aggregate perceptions in Niehues' (2014) study, calls in to question the validity of the results indicating it to be an effective measure.

Alternatively, it is possible that the lack of significant associations with CFC were due to it not being an underlying cognitive factor, rather than an issue with the measures of inequality or relative position. However, this would not account for the lack of association with the aggression measures. Although, CFC was not found to be significantly associated with aggression either, which would further indicate that it may not be a relevant cognitive factor. Alternative known factors that are associated with aggression and violence that could be investigated as potential underlying mechanisms include; self-control (McGuire & Broomfield, 1994), or impulsivity (Gordon & Egan, 2011; James & Seager, 2006; Vogel & Van Ham, 2018); and other risk-taking behaviours (Mishra & Lalumiere, 2009; Liang, et al, 2007), potentially reflective of a general tendency for risk. These traits are all elements of Gottfredson and Hirschi's (1990) general theory of crime; that a lack of self-control manifests itself in various ways, including criminal and other risk-taking behaviours. However, these all have conceptual overlap with CFC. Further research should include both CFC and alternative risk-factors for aggression, particularly as it is not known whether the

null results in the current study were due to inappropriate measures of perceptions of inequality.

One limitation of the current study was that it was self-report, and that the CFC and aggression measures may have been subject to a social desirability bias, hiding any associations that may have been present. However, it is worth noting that for an individual that values status and endorses aggression as a means of defending their status, aggression may not necessarily be seen as an undesirable trait.

Another limitation was in regard to the demographics of the sample, which was over-represented by students (43%). As education is generally associated with a higher socioeconomic status, which at student-age, is not reflected in personal income; this is a highly unusual sample. This means that it is unlikely that there would not have been sufficient representation of the views of lower socioeconomic status individuals, or even very high status individuals with large personal incomes. As a result of this, subsequent studies used the online participant recruitment platform Prolific Academic, in order to avoid this over-representation of student participants.

A further limitation of the study was that it depended on the variability in participants' ability to correctly perceive inequality on a national level in order to achieve the variation necessary for analysis; and determine whether perceptions of national inequality had any relationship with their cognition. As there was no variation in the actual inequality of each participants country; the analysis inadvertently depended on a variation in accuracy. Considering that perceptions of UK inequality did vary between participants, and the lack of significant associations between this perception and aggression and CFC, this calls into question either the effectiveness of the measure to accurately reflect people's perceptions, or the extent which participants are able to accurately perceive the level of inequality in their country. Although, it is possible that perceptions of overall inequality are influenced by an individuals' position within the distribution as indicated by Xu and Garand (2010), or as proposed by Hauser and Norton (2017), an overdependence on local cues. Further analyses (see section 3.3.5.1) showed no clear associations between the diagram chosen as representing participant neighbourhood socioeconomic distribution and diagram chosen as representing the UK socioeconomic distribution, which is inconsistent with an overdependence on local cues. UK inequality diagram choices showed significant differences

in perceived personal position, and perceived previous family position (see section 3.3.5.2.1). Local inequality diagram choices showed significant differences in perceived personal social position, ratings of income, and ratings of living conditions relative to others in the UK. These associations show some indication that one's personal social position may affect how they view the socioeconomic distribution. However, the results from the current study do not appear to indicate that this extends to a general effect on cognition.

The lack of associations between aggression or CFC and perceived relative position, income, or living conditions, may be indicative that it is a specific environmental cue other than income or living conditions that trigger these cognitive and behavioural changes; and not an overall perception of 'where one stands' in society. Research by Griskevicius et al (2009) showing participants to actually cite status as a motive for their aggressive behaviour, could be interpreted as indicating an explicit understanding of what their status *is*, but this is not supported by the results of the current study, and isn't necessarily *essential* for an individual to be driven by status. The inequality and social position questions were apparently sensitive *enough* to pick up on some associations with each-other, but not enough to explain inequality-violence link. It may be how someone *experiences* their social position that effects cognition. Using a measure that looks further into this aspect of personal social position may be a more valuable avenue of research in explaining the underlying mechanisms of the relationship between economic inequality and violence.

One alternative psychometric instrument, for assessing how people view their position in an unequal society, is the Personal Relative Deprivation *(revised)* (PRD-r) scale (Callan et al, 2008; Callan et al, 2011), which asks participants to report how deprived they feel "relative to others like them'. This has the drawback of being somewhat vague in terms of reference groups or cues, which will limit what it can tell us about the mechanisms linking economic inequality to violent crime. However, this generality may mean it can act as a 'catch-all' type instrument, that is sensitive enough to encompass whatever the relevant cues and reference groups happen to be. It is also potentially more reflective of how one *experiences* inequality and their social position. It may be that the measures of personal social position were ineffective measures. With each personal social position question being theoretically separate variables consisting of only one question (the specifics of which were novel to the current study), there is no opportunity for validation with measures of internal

consistency. The PRD-r however, is a more robust scale with a strong basis of evidence for its efficacy, and has repeatedly been shown to have good internal reliability (e.g. see Callan et al, 2011; Callan et al,, 2015; Kim et al, 2017). Moreover, PRD has demonstrated associations with relevant variables, including criminal convictions (Mishra & Novakowski, 2016); a preference for risk in other domains including ethical, health and safety domains, and gambling behaviour (Mishra & Novakowski, 2016); impulsivity (Mishra & Novakowski, 2016); and self-reported previous aggressive behaviour (Greitmeyer and Sagialou, 2019). This suggests that the PRD-r scale is a potential avenue for investigating some of the underlying mechanisms connecting economic inequality with violence; and has consequently been used in Study 3.

In summary, the current study aimed primarily to examine whether perceptions in inequality in society as a whole, or at the neighbourhood level, predicted scores on measures of psychological risk factors for violence. No associations were found between perceptions of inequality and either self-reported aggression or consideration of the future. However, this may have been due to issues with how participants interpreted the measures of perceived inequality, suggesting that subsequent research should endeavour to use alternative measures that are more robust, and target how one experiences inequality at the individual level.

4. Chapter 4:   Study 3 - Perceptions of inequality, personal relative deprivation and associations with psychological risk factors for aggression

4.1. Introduction

4.1.1. Introduction

As explained in the previous chapter, the proximate psychological changes that underpin observed associations between socioeconomic inequality and interpersonal violence are not fully understood. Study 2 attempted to investigate some of the potential underlying cognitive mechanisms that may be involved at the individual level, looking at several exploratory factors relating to how we perceive inequality and how it may affect our cognition. The measure of perceived inequality at a national and local level used a pictorial measure from the 2009 ISSP (2017) depicting 5 shapes of different socioeconomic distributions, that has previously been used to investigate differences in perceptions of inequality between countries (Brunori, 2017; Hadavand, 2017; Niehues, 2014; Gimpelson & Treisman, 2018; ISSP, 2017, Q14a, p13). Study 2 was the first to use this to examine how individual differences in responses to this item predict risk factors for involvement in violence, as explained in Chapter 3. Such an approach has advantages over using an aggregated measure of perceived inequality that does not take into account variability between individuals. However, Study 2 found no associations between diagram choices and risk factors for violence; in the form of Griskevicius et al's (2009) interpersonal aggression measure and Strathman et al's (1994) Consideration of Future Consequences Scale (CFC). Measures of social position (as based on ISSP, 2017, Q14b, p13) in Study 2 intended to investigate whether perceptions of current social position, or social position during development associated with aggression or CFC, and also found no associations. Ratings of income and living conditions relative to others at a local and national level based on questions from the Afrobarometer (2005, Q2b; Rustad, 2016) also showed no evidence of being cues to inequality that affect cognition. As a result of these findings, the current study (Study 3) utilised an alternative measure related to the *experience* of inequality, rather than explicit observations of the shape or society or one's position in it, as well as cognitive factors associated with violent and criminal behaviour other than the consideration for

future consequences (CFC; Strathman et al., 1994). The previous questions remained in the questionnaire for comparative purposes.

4.1.2. The Experience of Inequality

Study 2 did not find aggression or CFC to be associated with perceptions of overall UK or national inequality; personal social position within those distributions either currently or during development; or perceptions of relative living conditions or income. However, it is possible that explicit perceptions of these distributions are not necessarily the drivers of the cognitive changes that lead to an increased proclivity for violence in economically unequal contexts, but rather the consequences that these contexts have on one's subjective experience. The Personal Relative Deprivation *(revised)* scale (PRD-r, Callan et al, 2008; Callan et al, 2011) asks respondents how deprived they feel relative to other people 'like them'. The feeling of being deprived relative to others is more directly related to how one subjectively experiences inequality, and is potentially easier to perceive than the measures used in Study 2. Whilst the Study 2 measures were existing measures, there are reasons to potentially doubt their efficacy in this context.

The International Social Survey Programme (ISSP) measures of inequality taken from the ISSP 2009 survey (2017) have not been widely used in peer reviewed studies; certainly not studies examining individual, rather than between country, differences. Moreover, all of the measures in Study 2 were amended for the purposes of the study. For example, the original question from the Afrobarometer asking participants to rate their living conditions relative to other Nigerians were amended to refer to neighbourhood reference groups as well as others in the UK, as-well as to ask about income, meaning that they had not been previously established as effective measures in the form they were used in. Each question had intended to measure a distinct variable, and so it was also not possible to calculate internal reliability. The PRD however, has consistently shown good internal reliability (e.g. see Callan et al, 2011; Callan et al, 2015; Kim et al, 2017), and has a substantial body of research providing evidence for its efficacy, having previously shown associations with factors related to self-control, including impulsivity and sensation seeking (Mishra & Novakowski, 2016); future discounting (Mishra & Novakowski, 2016); materialism (Zhang et al, 2015); expressed preference for risk in ethical, gambling and health and safety domains (Mishra & Novakowski, 2016); gambling behaviour (Callan et al 2008; Mishra & Novakowski,

2016); antisocial and criminal behaviour (Mishra & Novakowski, 2016); and decreased physical and mental health (Mishra & Carleton, 2015).

Another potential explanation for the lack of associations in Study 2 is that perceptions of relative living conditions or relative income, which were measured as potential cues to inequality; are not the factors that are integral to driving changes in cognition; and that it is alternative cues in the environment that arise as a result of inequality, that are responsible for the cognitive changes that increase one's likelihood of violence. Alternatively, it may be that the reference groups investigated in Study 2 (in the form of others in one's neighbourhood, and others in the UK) were not appropriate. If this is the case, PRD may be general enough in nature to pick up on whichever cues or reference groups are most salient to them. The many associations found between PRD and other variables provides some evidence for its efficacy as a suitable enough measure related to the individual level experience of inequality.

4.1.3. Personal Relative Deprivation and Aggression

A further strength of the PRD scale is that there have been a number of other previous studies looking at the association between aggression and feeling deprived relative to others. Previous studies attempting to experimentally induce perceptions of relative deprivation have found associations with increased hostility. A series of studies by Greitemeyer and Sagioglou (2016; 2017; 2018; 2019a; 2019b) have demonstrated this, using false feedback paradigms to induce perceptions of a relative deprivation of resources relative to similar others, or others in their assigned group. Often, feelings of deprivation were measured using an amended version of Callan et al's PRD (2008; 2011); tailored so that it referred specifically to the study and reference group in question. They demonstrated the association across several hostility measures, such as the State Hostility Scale (Anderson et al, 1995), as well as other behavioural measures. For example, when asked to rate the PhD student responsible for designing how their relative status was assessed, in order to determine whether their contract should be terminated, participants who felt more deprived gave harsher feedback (Greitemeyer & Sagioglou, 2016; 2017; 2018).

In a more recent study, Kassab et al (2020) manipulated perceptions of relative deprivation with a rigged financial game against a fictional opponent. A behavioural measure of aggression was used in the form of a point-subtraction paradigm, where

participants could choose to destroy coins earned by their opponent by clicking on them. Again, using a tailored manipulation check inspired by the PRD-Scale, they found that participants rigged to lose more felt more deprived than participants rigged to win more, and also showed more aggression towards their opponents. The findings from these studies indicate that experimentally induced feelings of deprivation are associated with a proclivity for aggression. Moreover, PRD itself has been found to be associated with aggression related measures. Mishra and Novakowski (2016) found an association with self-reported antisocial behaviours (using the Self-Report Early Delinquency Instrument; Moffitt & Silva, 1988), and criminal outcomes. Since the current study (Study 3) was designed and conducted, this association has been further replicated in more recent research.

In a task where participants recalled experiences of either ostracism or inclusion to induce feelings of relative deprivation, Jiang and Chen (2020) found that the resulting PRD scores mediated any subsequent associations with aggression on a variety of measures, including the Buss and Perry Aggression Questionnaire (Bryant & Smith, 2001; Buss and Perry, 1992) the cold water task version of the Taylor Aggression Paradigm (TAP, Taylor, 1967; Poon & Chen, 2014) and the voodoo doll paradigm (DeWall, et al, 2013). Greitmeyer and Sagialou (2018) found an association between PRD and Krahé & Möller's (2010) self-report measure of previous aggressive behaviour.

The current study (Study 3) was conducted to build on this previous literature, and establish whether a sense of personal relative deprivation predicts key psychological risk factors for involvement in violence in a sample from the general UK population. Much of the previously discussed research has involved samples drawn from university student populations. It is expected to corroborate the findings so far discussed, with the added benefit of using Griskevicius et al's (2009) interpersonal aggression measure (as used in Study 2). In this aggression measure, participants are asked to imagine they are at a party, when someone spills a drink on them in front of everyone, and then to rate their likelihood of reacting with various aggressive responses. As noted in Study 2, the results from Griskevicius et al's (2009) original studies indicated that males tended to show more direct aggression than females using this measure, and that competitive conditions resulted in higher aggression scores than courtship or neutral conditions. This suggests that it is

particularly suited to the investigation of perceptions of relative deprivation and aggression within the context of intrasexual male competition.

4.1.4. Cognitive Risk Factors for Violence

Study 2 attempted to explore whether perceptions of inequality in society and/or perceptions of one's own social position, predicted cognitive variables that are arguably risk factors for involvement in interpersonal violence. As aggression and criminal behaviour l has been found to be negatively associated with consideration of the future (e.g. Joireman et al, 2003; Trommsdorf & Lamm, 1980; Mahler et al, 2017), Consideration of Future Consequences (CFC) was included as a possible candidate in Study 2, but no significant associations were found with any of the measures of perceived social position or inequality. As explained above, the current study looked at this again in relation to perceptions of personal relative deprivation. In addition to this, other known risk factors for violence were also measured as potential underlying cognitive mechanisms for the association.

Part of the reasoning for including CFC in Study 2 was due to its conceptual overlap with factors related to present time orientation, such as self-control, impulsivity and future discounting; a cluster of traits which are associated with aggression and violence.

Time orientation and consideration of future consequences are clearly overlapping concepts; the former referring to the tendency for an individual to think about things in relation to either in the past, present or future; whereas the CFC scale, unsurprisingly, is more specific in that it refers exclusively to the extent to which an individual thinks about the future during decision making, and the consequences of their actions.

Delay discounting refers to the established tendency for individuals to assign lower values to rewards that they must wait longer for. The extent to which this occurs will vary between individuals, so that those who have a higher tendency to discount the future will be more likely to choose immediate rewards over delayed ones. Similarly, CFC will also vary between individuals, so that those who score higher will consider future outcomes more during decision making, where those with lower scores will consider the future less during decision making.

The similarity of the constructs lies in the fact that they measure the extent to which individuals attached weight to, or focus on, future versus present outcomes. The difference between the two constructs lies in the fact that delay discounting focuses on rewards, rather than future consequences, and takes a quantitative approach to the size of that reward and the time period necessary to change the value it holds. Delay discounting has been found, as one would expect, to be negatively associated with consideration of the future (Macaskill et al, 2019). There are also links between these concepts and self-control and impulsivity. Reduced consideration of future consequences could be likened to having reduced self-control, or an increase in impulsivity, as all of these refer to acting with reduced forethought of future consequences of their actions. Findings from several studies provide support for the conceptual overlap between these characteristics, showing positive associations between two or more of them.

Mobini et al (2007) found levels of delay discounting to be positively associated with several measures of impulsivity; including the functional, dysfunctional, and total scores on the Dickman impulsivity inventory (DII, Dickman, 1990); and the non-planning subscale, and total impulsivity scores on the Barratt's impulsiveness scale (BIS-II, Patton et al., 1995). Macaskill et al (2019) found delay discounting to be negatively associated with CFC (Joireman, et al., 2012; Strathman et al., 1994). Mishra et al (2017) found significant associations between Eysenck et al's impulsivity measure (1985); low self-control on the retrospective behavioural self-control scale (RBS; Marcus, 2003); higher sensation seeking on Zuckerman's sensation seeking scale (1994); a preference for risk using the domain specific risk-taking scale (DOSPERT; Blais & Weber, 2006); The Gambling Behaviour Scale; (Mishra et al, 2011); The Problem Gambling and Behaviour Index (Ferris & Wynne, 2001); The Balloon Analogue Task (Lejuez et al., 2002); and an adapted version of the Money Choice Task (Mishra & Lalumière, 2010; Fessler et al, 2004). In another study, Mishra and Lalumière (2017) investigated these associations using two measures of delay discounting. The first was a single shot discounting money choice task with only 1 question (a sooner, smaller reward vs a larger later reward. The second had 27 choices varying in magnitude of present and future reward options, using a discounting parameter *(k)* as the dependent variable (Kirby et al, 1999). Higher discounting in these two measures were associated with

higher impulsivity (Eysenck et al, 1985), lower self-control (RBS; Marcus, 2003), and a preference for risks (DOSPERT; Blais & Weber, 2006).

A further example of the conceptual overlap between these traits is demonstrated in a study by Gordon and Egan (2011), which was cited in Chapter 3 in support of CFC's inclusion in Study 2. That study investigated several measures of impulsivity as postdicters of breaches of prison discipline and violent criminal convictions in a sample of offenders. Impulsivity was measured using both Eysenck's measure of impulsivity from the Impulsiveness, Venturesomeness, and Empathy Inventory (IVE; Eysenck et al, 1985), and Barratt's Impulsiveness Scale (BIS-II, Patton et al, 1995). The BIS-II (Patton et al, 1995) is comprised of 3 factors; attentional-impulsivity; motor-impulsivity; and non-planning impulsivity. As well as a significant association with Eysenck's impulsivity measure, violent convictions were also significantly associated with the non-planning and motor facets of the BIS-II (Gordon and Egan, 2011). The non-planning facet attempts to measure the extent to which someone plans actions carefully, whilst the motor facet is intended to measure the extent to which they act without thinking.

There is clear conceptual overlap between the extent to which one plans tasks, and the extent to which one considers the future, as one must consider the future in order to plan. Furthermore, as mentioned previously, to be impulsive is to act quickly without much thought, whereas the CFC scale measures the extent to which one thinks about the future consequences of one's actions and decisions. So it could be argued that having little consideration for future consequences is a pre-requisite for impulsive actions to occur; but this could take several forms (that may not necessarily be adequately captured by the CFC scale). It could take the form of reduced time spent thinking about negative consequences, reduced perception of likelihood of the negative consequence's occurrence, or reduced perception of the impact it will have on their own subjective experience. Nonetheless, these possibilities all tie-in to the concept of a general present time orientation; i.e. a general focus on the present.

An association between these various time orientation measures and aggressive or criminal behaviour, as indicated in Gordon and Egan's (2011) study is to be expected, and there is clear reason for the inclusion of present-time orientation measures in the current thesis. As explained by Daly and Wilson (2005), it is to be expected that individuals will be

more present-oriented in contexts where their fitness is uncertain, and competition is increased. Acting impulsively, discounting the future, and taking high-stakes risks may have adaptive value, when the future, and the prospect of realising delayed rewards, is uncertain, or even unlikely, due to an unstable environment. As explained throughout the current thesis, effective polygyny in humans means that increased socioeconomic inequality is expected to increase male intrasexual competition, as reproductive fitness becomes increasingly contingent on one's social status as the socioeconomic gradient increases. Following the aggressive impulse to defend one's reputation, in the high-stakes environment of a steep socioeconomic gradient, becomes entirely necessary for reproductive fitness. It cannot be guaranteed that a 'safer' opportunity will arise later, when access to the necessary resources is so highly variable (for a review of the literature see e.g. Daly and Wilson, 2005; Daly, 2017). Deferring for future rewards in these situations can appear even less reasonable when one considers that mortality itself becomes variable; research has shown economic inequality to be associated with homicide rates and life expectancy (Wilson & Daly, 1997).

The association between the impulsivity measures and violent and criminal behaviour in Gordon and Egan's (2011) study is not the only example showing a relationship between present-time orientation related characteristics and aggression or crime. Research has demonstrated impulsivity to have associations with antisocial behaviour, "delinquency" (Romero et al, 2001); a peak in rates of offending in young men (Loeber et al, 2012); assault rates in male prisoners against other men (James & Seager, 2006); and self-reported violent behaviour in US adolescents (Vogel & Van Ham, 2018). This latter association was found to be strongest in more deprived neighbourhoods (Vogel & Van Ham, 2018), something that builds an even stronger case for inclusion in the current research. In the case of the previously mentioned study by Gordon and Egan (2011) looking at various measures of impulsivity, it was Eysenck et al's impulsivity scale (1985), rather than the BIS-II subscales (Patton et al., 1995), which they found to be the most reliable "for postdicting breaches of prison discipline and violent criminal convictions" (p. 305).

Joireman et al (2003) investigated the relationship using several measures of aggression; including the Zuckerman-Kuhlman Personality Questionnaire (ZKPQ), Aggression-Hostility subscale (Zuckerman et al, 1993); Buss and Perry's (1992) Aggression

Questionnaire; the Aggression Response Inventory (ARI; Tangney et al, 1996). In the majority of bivariate analyses, aggression scales showed significant associations with time orientation measures, so that those scoring high in aggression were more likely to score lower on the CFC (Strathman et al., 1994); higher in impulsive sensation seeking (ZKPQ; Zuckerman et al, 1993); in boredom susceptibility, and in disinhibition subscales (Zuckerman's sensation seeking scale-Form V, 1979).

In research looking at the relationship between criminal behaviour and delay discounting, Mishra and Lalumiere (2017) found that those who had been arrested, charged, convicted or incarcerated were significantly more likely to have chosen the sooner, smaller reward when only presented with one question; and were shown to have higher discounting rates in the Kirby et al (1999) discounting parameter measure.

A relationship between delay discounting on a hypothetical money task and engagement in property crime was found in a three-year study on undergraduate students (Lee et al, 2017). Delay discounting on the Money Choice Task (Fessler et al, 2004) was found to be a significant predictor for self-reported property crimes in the following year, using the Crime and Analogous Behaviour Scale (CAB) (Lynam et al, 1999; Miller & Lynam, 2003), in which participants indicate whether they have engaged in a range of 69 criminal behaviours, including property crimes (such as theft); violent crimes (such as physical altercations); or drug crimes (such as selling drugs) . Despite expecting a bidirectional relationship between property crime scores and delay discounting scores (i.e. as delay discounting in year 1 predicted property crime in year 2; it was expected that property crime scores in year 1 would predict delay discounting scores in year 2), they found that property crime did not predict levels of delay discounting in the following year. However, when looking at violent crime (also measured via the CAB), the reverse was found. Violent criminal activity reported in year one predicted delay discounting in year two, but delay discounting in year one was not a predictor of violent crime reported in year two. This finding makes it unclear as to whether delay discounting can truly count as a 'risk factor' (predisposing characteristic) for violent crime specifically. It is unclear whether this is due to the nature of the use of a 'hypothetical' money task, the focus on delay discounting specifically, or whether this group of concepts as a whole is simply not a contributing factor. Lee et al (2017) suggested that the results may be reflective of a relatively 'hotter' pathway

in violent crimes compared to property crimes. It is possible that a thought exercise such as a choice task may not adequately pick up on this kind of impulsivity.

To summarise, impulsivity is a worthwhile candidate to include in a set of measures when looking at underlying cognitive mechanisms for the inequality-violence relationship because of its known association with aggressive, violent and criminal behaviour. In the case of Gordon and Egan's (2011) investigation, it was Eysenck's impulsivity measure that they concluded to be the most reliable and best at postdicting breaches of prison discipline and violent criminal convictions, rather than the BIS impulsivity subscales which had more conceptual overlap with CFC. Whilst there is conceptual overlap between CFC, impulsivity and delay discounting in that they tap into an individual's time orientation, there are subtle differences. As explained above, delay discounting takes a quantitative approach to the size of the reward and period of delay involved, whereas impulsivity is focused more on the extent to which someone acts quickly, and with reduced forethought. Considering the strong basis of evidence for impulsivity as a factor related to violent and criminal behaviour, in particular Eysenck's measure of impulsivity (Eysenck et al., 1985), and the mixed evidence for delay discounting (Lee et al., 2017), it was concluded that Eysenck's impulsivity scale may be the best candidate trait to include in the current study, in order to investigate the proximate psychological mechanisms in the inequality– violence association.

4.1.5. Crime as a Form of Risk-Taking Behaviour

Another trait which overlaps with a focus on the present is the extent to which someone takes risks. As explained previously, a propensity for risk has been associated with measures of impulsivity, delay discounting, reduced self-control, and sensation seeking (Mishra et al, 2017).

Furthermore, much criminal behaviour can be viewed as a form of risk-taking (Dahlbäck, 1990; Dhami & Mandel, 2012; Jones & Quisenberry, 2004). As explained by Dahlbäck (1990) a risky behaviour is one where the outcomes are uncertain, and variable in their favourability. The majority of criminal behaviour meets this criterion; in that the outcome of committing the crime can be either highly favourable to the perpetrator if he/she can evade detection, or highly unfavourable if he/she is caught; so that one is either much better, or much worse off than before the crime was committed. In the case of the violent altercations that are the subject of interest in the current thesis, the outcomes are

again highly variable. The positive outcomes include being able to maintain or even increase one's status among peers or within a community, which has the benefit of potentially increasing one's access to mates (Wilson & Daly, 1985). This comes however, not only with the risk of detection by law enforcement, and criminal sanctions, but also a negative impact on one's status, injury, or even death.

The concept of crime as a form of risk-taking is reflected in Gottfredson and Hirschi's (1990) general theory of crime; that a lack of self-control will manifest itself in several ways, including criminal, non-criminal, socially acceptable and non-socially acceptable risky behaviours. Furthermore, it also incorporates the connections with a present time orientation. This is consistent with the studies described above showing associations between impulsivity, aggressive behaviour, and other forms of risk-taking (e.g. Gordon & Egan, 2011; Joireman, et al, 2003; Mishra & Lalumière, 2017; Mishra et al, 2017). Further research has corroborated an association between aggressive or criminal behaviour and other forms of risk-taking.

Mishra et al's (2017) study, described above, demonstrated an association between self-reported criminal behaviour and problem gambling. Moreover, Dahlbäck (1990) asked a sample of male university students to report the number of crimes they had previously committed (from a list of relatively minor crimes), and to choose stakes in a gambling game, where higher stakes meant potentially higher rewards, but had reduced chance winning. The number of crimes reported was found to be strongly associated with higher risk-taking in the gambling task. Mishra and Lalumière (2009) found changes in homicide rates over time during the 1990s, to be associated with changes in rates of most indicators of sexual health risk behaviours and outcomes, driving related accidents, and school drop-outs in Canada and the US. A study comparing towns in Finland found associations between local crime rates and respondents' smoking behaviour (Virtanen et al., 2007).

Research examining individual differences in behaviour has also demonstrated an association between criminal and other risk-taking behaviours. Hanoch and Gummerum (2011) looked at risk taking behaviour in prisoners relative to non-prisoners using the Domain Specific Risk-Taking scale (DOSPERT; Johnson et al, 2004). The DOSPERT consists of 5 subscales measuring risk taking behaviour across social; recreational; financial; health/safety; and ethical domains. They found that prisoners reported taking more health-

related risks than non-prisoners, but not more financial, ethical, recreational or social-related risks. This lack of risk-taking in other domains is not consistent with the theory that criminal behaviour is reflective of a general preference for risks.

As explained in previous chapters, it has been theorised that the relationship between inequality and male violence is a result of evolutionary pressures. Any increase in the socioeconomic gradient increases the fitness consequences of success (or failure) in competition for resources and status, as both can affect access to mates. As explained by Wilson et al (2009) this means that higher inequality (and the resulting increased variation in male fitness) should be expected to increase competitive risk-taking amongst men for the purposes of defending or increasing one's status; which has very real implications on male fitness. As inequality increases, the effect that one's status has on one's reproductive success increases, and the benefit of taking risks within the arena of male-male competition increases. If it is the case that inequality leads to *domain specific* risk-taking (rather than a global increase in propensity for risks), and that this relationship is the result of these evolutionary pressures, then it could potentially be more valuable to look at risk-taking across domains informed by evolutionary theory. The Evolutionary Risk Scale (ERS; Wilke et al, 2014) measures risk-taking behaviour across the evolutionary informed domains: between-group competition; within-group competition; status/power; environmental exploration; food selection; food acquisition; parent-offspring conflict; kinship; mate attraction; and mate retention. If the inequality-violence relationship was driven by domain specific risk-taking, it may be expected that it would include domains most closely related to intrasexual competition, such as the status/power, within group competition, and between group competition were domains.

4.1.6. Conclusions and Hypotheses

Based on the literature reviewed above, Study 3 aimed to improve on Study 2 in several ways. Perceptions of personal relative deprivation were measured using Callan et al's (2008; 2011) Personal Relative Deprivation-revised (PRD-*r*) scale, to supplement the original measures of inequality and personal social position from Study 2 which failed to show any associations with aggression (Griskevicius et al, 2009) or consideration for future consequences (CFC). Looking at both PRD as well as perceptions of overall inequality will indicate whether the perceived level of competition, or one's position in society, affects

cognition in any way (something that was not indicated in Study 2), or whether it is exclusively one's subjective experience of inequality that affects cognition and behaviour (as measured by the PRD-*r*).

The literature reviewed above indicates that there are associations between PRD and present time orientation traits such as impulsivity and self-control; criminal behaviour; other risk-taking behaviours; and aggression (e.g. see Mishra and Novakowski, 2016). The present study aimed to replicate these findings, using Eysenck et al's (1985) measure of impulsivity (as in Mishra and Novakowski; 2016); and the novel measures of the Consideration of Future Consequences Scale (CFC; Strathman et al., 1994); the Evolutionary Risk Scale (ERS; Wilke, et al, 2014); and Griskevicius et al's (2009) measure of aggression in hypothetical social situations. This scale has not previously been investigated in relation to PRD, and as explained in Chapter 3, uniquely appears to focus on the extent to which someone will use aggression in order to "save face" in a social situation that is easy to relate to. This is particularly relevant to the focus on intra-sexual competition and status in this thesis, and complements the literature that has indicated that the majority of homicides involve both male victims, and male-perpetrators; and most are explicitly competitions over status and "face" (e.g. see Wilson & Daly, 1985; see also discussion by Daly et al, 2017).

The impulsivity and risk-taking measures supplemented the CFC (as used in Study 2) as candidate proximate psychological changes that underpin the observed associations between inequality and interpersonal violence (such as in Study 1). It was predicted that those who scored as feelings of deprivation as measured by the PRD scale would be positively associated with scores on Griskevicius et al's (2009) measure of aggression in hypothetical social situations; Eysenck et al's (1985) measure of impulsivity; and risk-taking scores in the Evolutionary Risk Scale (ERS) developed by Wilke, et al (2014); and negatively associated with scores on the consideration of future consequences (CFC) scale (Strathman et al., 1994). Exploratory questions to be addressed were whether PRD was associated with risk-taking across all domains of the ERS, or domains relevant to intrasexual-competition such as the status/power, between group competition, and within group competition domains.

Additionally, to maintain consistency with Study 2 the measures of inequality and social position were included in the current study. The current study aimed to determine

whether the null findings in Study 2 would be replicated, or whether the inclusion of a participant pool less biased by students may reveal associations between the psychological risk-factors for violence, and the perceptions of UK and local inequality measures (ISSP, 2017, Q14, p13); or with the measures of social position, which asked about current and familial social position (based on ISSP, 2017, Q14, p13), as well as cues of position in the form of relative income and living conditions (based on Afrobarometer, 2005, Q2b; Rustad, 2016).

4.2. Methods

4.2.1. Participants

Participants were recruited via the participant recruitment platform Prolific Academic to take part in a survey study investigating "Economic views and behavioural choices". A total of 318 participants took part in the study. There were 157 males and 160 females, ages 18 to 71 (M = 34.18, SD = 11.42), including 1 participant who did not report a gender. The average education level in the sample was reasonably high, as shown in Table 4.1, the majority of participants had achieved an A-level qualification or higher (79.25%), and 44.34% had at least a degree level qualification. Very few had no formal qualifications (0.63%, n = 2). In regard to employment (Table 4.2), 35.8% (n = 114) were employed full time, 13.5% were employed part-time, and 36.9% were not working for various reasons. For each analysis, pairwise-deletion was used to deal with missing values.

Table 4.1

Highest Level of Education Completed by Participants

Education Level	Frequency (n)	Percentage (%)
Higher degree (e.g. PhD, MSc)	30	9.4
Degree level qualification (e.g. BSc, BA, or equivalent)	111	34.9
Higher educational qualification below degree level (e.g. PGCert, PGDip)	24	7.5
A-Levels or Highers	87	27.4
ONC / National Level BTEC	14	4.4
O-Level / GCSE / CSE	43	13.5
Other qualifications (inc. foreign quals below degree level)	7	2.2
No formal qualifications	2	0.6

Table 4.2

Participant Employment Status

Employment Status	Frequency (*n*)	Percentage (%)
Employed full time	114	35.8
Employed part time	43	13.5
Unemployed and currently looking for work	18	5.7
Unemployed and not currently looking for work	11	3.5
Student	37	11.6
Retired	7	2.2
Homemaker	26	8.2
Self-employed	44	13.8
Unable to work	18	5.7

4.2.2. Measures

4.2.2.1. *Inequality Measures*

The following measures were used in relation to perceptions of inequality.
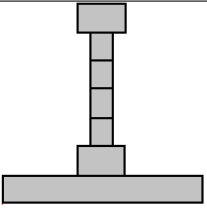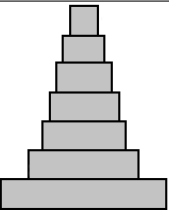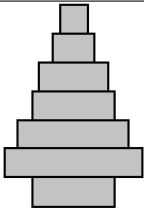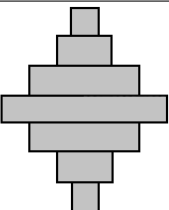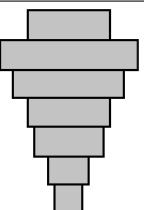
4.2.2.1.1. Perceived Personal Relative Deprivation

The Personal Relative Deprivation-*revised* (PRD-r) Scale (Callan et al, 2008; Callan et al, 2011) was used to measure participants' subjective experience of inequality (*Appendix F*). The scale consists of 5 items which assess the extent to which participants feel deprived relative to others 'like them', and has been shown to have good internal reliability (α = .78, Callan et al, 2011; α = .83, Callan et al, 2015; α = .87, Kim et al, 2017). Participants were asked to indicate the degree to which they agree with five statements on a 6-point Likert scale, ranging from strongly disagree to strongly agree. Two of the items were reverse scored, and the average of the scores was calculated in order to attain a perceived personal relative deprivation score for each participant.

4.2.2.1.2. Perceptions of Inequality and Social Position

In order to maintain comparability with the results in Study 2, the diagram measures of perceptions of UK and Local Inequality were retained for the current study. The measures consist of 5 diagrams depicting different shapes of socioeconomic distributions (see *Figure 4.1*), and originate from the social inequality module of the International Social Survey Program (ISSP, 2017, Q14, p13).

Figure 4.1

The Diagram Measure of Perceived Inequality

Type A	Type B	Type C	Type D	Type E
A small elite at the top, very few people in the middle and the great mass of people at the bottom.	A society like a pyramid with a small elite at the top, more people in the middle, and most at the bottom.	A pyramid except that just a few people are at the bottom.	A society with most people in the middle.	Many people near the top, and only a few near the bottom.

Note. The diagrams used to measure perceived inequality, originally from the 2009 ISSP (2017; p.13) from which participants choose the type that most closely resembles the income distribution in the UK and their local area.

As in the ISSP (2017) the 5 diagrams in Figure 4.1 were provided as possible answers for a question regarding which one they believed to be the closest representation of society, but with the necessary specification of looking at the UK today; "These five diagrams show different types of society. Please read the descriptions and look at the diagrams below. What type of society is the United Kingdom today? Which diagram comes closest?". Following this, the question was repeated with wording amended in order to investigate local inequality, rather than country-level inequality; phrased as

"Now think about the local area where you live (i.e. your neighbourhood). These five diagrams show different types of neighbourhood. Please read the descriptions and look at the diagrams below. Which diagram most closely resembles your neighbourhood today?".

Participants' beliefs about their social position relative to others was assessed using two further questions from the ISSP (2017, Q10a, Q10b), answered using a 10-point numerical scale, and worded as follows:

"In our society there are groups which tend to be towards the top and groups which tend to be towards the bottom. Below is a scale that runs from top to bottom. Where would you put yourself now on this scale? (Please tick one box)" (ISSP, 2017, Q10a);

"And if you think about the family that you grew up in, where did they fit in then? (Please tick one box)" (ISSP, 2017, Q10b).

Lower answers closer to "1" represented lower social positions; whereas higher answers closer to "10" represented higher social positions.

In order to explore further explore the importance of present versus previous familial position at both a local and national level; as well as explore what factors individuals may use as indicators of relative social position, questions from the Afrobarometer (2005, Q2b; as used by Rustad, 2016) were adapted as follows for the current study:

"In general, how do you rate your income compared to those of other people in the UK?"

"In general, how do you rate your living conditions compared to those of other people in the UK?"

"In general, how do you rate your income compared to those of other people in your local area/neighbourhood?"

"In general, how do you rate your living conditions compared to those of other people in local area/neighbourhood?"

Answers for these questions were given in the form of a Likert scale ranging from 1("Much worse off"), to 5 ("Much better off").

4.2.2.2. Risk-Factors for Violence

The following measures were used to measure proclivity for aggression, as well as risk-factors for violence, included in the investigation as candidate proximate psychological mechanisms that may link inequality with violence.

4.2.2.2.1. Aggression

As in Study 2, a self-report measure from Griskevicius et al (2009) was used in order to measure the participants' likelihood of aggression in social situations (*Appendix C*). The scale includes 2 subscales; direct, and indirect aggression, which have both been shown to have good internal consistency (α = .78 - .80; Griskevicius et al, 2009). Questions are preceded by a description of a social situation which participants are asked to imagine themselves in, where they are at a party and somebody from their class spills a drink on them and does not apologise. They are then asked how much they would want to engage in a list of 8 behaviours (4 involving "Direct Aggression", and 4 involving "Indirect Aggression") on a scale from 1(not at all) to 9 (very much). The mean for the indirect aggression items was then calculated to attain an indirect aggression score; the same was done for the direct aggression items, and the overall aggression score.

4.2.2.2.2. Risk Taking

Proclivity for risk-taking was measured using the Evolutionary Risk Scale (ERS; Wilke et al, 2014; *Appendix G*). It measures risk-taking behaviour in 10 evolutionary domains which have been shown to have moderate-acceptable internal consistency (Wilke et al, 2014); between-group competition (n = 3, α = .58 - .61), within-group competition (n = 3, α = .50 - .59), status/power (n = 3, α = .66 - .73), environmental exploration (n = 3, α = .67- .68), food selection (n = 3, α = .53 - .66), food acquisition (n = 3, α = .48 - .52), parent-offspring conflict (n = 3, α = .64 - .68), kinship (n = 3, α = .64 - .66), mate attraction (n = 3, α = .64 - .72), mate retention (n = 3, α = .60 - .67). Each item describes a behaviour related to a risky behaviour in its respective domain, and participants were asked to report their likelihood of engaging in that behaviour, should they find themselves in that situation. Participants reported this likelihood via a Likert scale ranging from 1 (extremely unlikely) to 7 (extremely likely). A score was calculated for each domain for each participant by taking the mean rating they gave for each item in that domain.

4.2.2.2.3. Impulsivity

Impulsivity was measured via Eysenck et al's (1985) 19-item impulsivity subscale (EIS; *Appendix H*) from the Eysenck Impulsivity, Venturesomeness and Empathy Inventory, which has been shown to have good internal consistency (α = .82 - .85, Eysenck et al, 1985).

Participants were required to answer "yes" or "no" to each item. For 16 of the items, an answer of "yes" equated to 1 point each, whilst the remaining 3 items were reverse coded, so that an answer of "no" for those items gave the participant 1 point each. For each participant their points were summed, giving them each an EIS score, where a higher score indicated higher trait impulsivity.

4.2.2.2.4. Consideration of Future Consequences

As in Study 2, the Consideration of Future Consequences (CFC) scale (Strathman et al, 1994; *Appendix D*) was included as a potential proximate cognitive factor. The CFC scale consists of 12 items which assess the extent to which an individual focuses on short-term or long-term consequences, and has been shown to have good internal consistency (α = .868, Strathman et al, 1994). Participants indicated how characteristic they believed each item to be of themselves via a Likert scale ranging from 1 (extremely uncharacteristic) to 6 (extremely characteristic), giving participants a score between 1 and 6 for each item. Of these 12 items, 7 were reverse scored (so that low agreement with the statement gave participants the full 6 points). The scores for each item were summed, giving each participant a CFC score, where a higher score indicates a higher consideration for future consequences, i.e. the extent to which an individual considers potential future consequences of their current behaviours.

4.2.3. Procedure

Ethical approval for this study was granted by Brunel University London College of Health and Life Sciences Research Ethics Committee (Reference: 7541-LR-May/2018- 12745-1; *Appendix I*). Participants were recruited via participant recruitment platform Prolific Academic, to take part in a study investigating "Economic views and behavioural choices". After providing informed consent online and given the opportunity to contact the investigators regarding any questions, participants completed the series of questionnaires hosted on Qualtrics. Participants were asked to provide demographic information, including their gender; age; ethnic group, education level, and employment status. These questions were followed by the questions regarding their perceptions of inequality, their social position as described above, which had been based on the Afrobarometer and the 2009 ISSP. This was followed by the PRD, CFC, EIS, ERS, and aggression questionnaires, for which

the order was randomised between participants to achieve counterbalancing. A debriefing form was then provided at the end of the questionnaire.

4.2.4. Data analysis

Pearson's correlation coefficients were calculated to test for bivariate associations between PRD scores and scores on measures of psychological risk factors for violence. As each of the participants self-reported perceived social position (as based on the Afrobarometer, 2005, Q2b; and the 2009 ISSP, 2017) consisted of only one question each, Spearman's rho was used to test for their bivariate associations between these ratings of social position and the measures of psychological risk factors for violence. Feelings of deprivation were predicted to be associated with an increase in the psychological risk-factors for violence.

As per Study 2, ANOVAs investigating participants' diagram choices for their perceptions of the UK socioeconomic Distribution as Predictors for scores on the measures of psychological risk factors for violence were carried out for each psychological risk factor. This analysis was repeated with participants' diagram choices for their perceptions of their local neighbourhood socioeconomic distribution as the predictive factor. This was to indicate whether particular perceptions of the shape of the local or national socioeconomic distribution, were associated with higher scores on risk-factors for violence. It was tentatively predicted that there would be no associations here due to the null results of Study 2, but it was acknowledged that testing of a participant pool less heavily biased by students may show differing results.

These analyses were followed by ANCOVAs, where PRD was included as a covariate, in order to see whether PRD scores were associated with scores on psychological risk-factors for violence, only for those who perceived particular shapes of the socioeconomic distribution (as per their diagram choices for either the local or national socioeconomic distribution). An interactive effect between diagram choices and PRD would suggest an interactive effect of perceived inequality and feelings of deprivation. Again, no strong predictions were made here, but it was considered that PRD may only be associated with increases in risk factors for violence in environments that are perceived to be higher in socioeconomic inequality (i.e. environments that have higher overall levels of competition). Alternatively, it was considered that feelings of deprivation may subsume any effect of

perceived inequality due to the potential importance of one's subjective experience of inequality (as described in the introduction).

4.3. Results

4.3.1. Descriptive Statistics

Descriptive statistics for the scale variables are shown in Table 4.3, the single item personal social position items in Table 4.4, and the categorical variables in Tables 4.5 and 4.6. Kolmogorov -Smirnov and Shapiro-Wilk tests indicated that there were significant deviations from normality for all the dependent measures (see Table 8). However, due to the relatively large sample size (> 300), central limit theorem means these deviations should not have a large impact on the tests used (Pearson's correlations, ANOVA and linear regression).

Table 4.3

Descriptive Statistics for 318 Participant Scores for all Scale Variables, Including Number of Scale Items, Scale Reliability, Score Range, Mean, and Standard Deviation

Numerical variables	Items *n* (α)	Possible Score range	Score Range	*M* (*SD*)
PRD	5 (.807)	5.00 - 6.00	5.00 - 6.00	3.16 (0.98)
CFC	12 (.868)	12.00 - 72.00	13.00 - 60.00	39.74 (8.17)
EIS	19 (.873)	0.00 - 19.00	0.00 – 18.00	6.77 (4.90)
Between group competition risk-taking (ERS)	3 (.558)	1.00 - 7.00	1.00 - 6.33	2.47 (1.22)
Within group competition risk-taking (ERS)	3 (.603)	1.00 - 7.00	1.00 - 7.00	3.47 (1.27)
Status/power risk-taking (ERS)	3 (.637)	1.00 - 7.00	1.00 - 6.33	1.59 (.896
Environmental exploration risk-taking (ERS)	3 (.693)	1.00 - 7.00	1.00 - 7.00	2.76 (1.46)
Food selection risk-taking (ERS)	3 (.497)	1.00 - 7.00	1.00 - 7.00	3.89 (1.32)
Food acquisition risk-taking (ERS)	3 (.452)	1.00 - 7.00	1.00 - 6.33	2.89 (1.19)
Parent-offspring conflict risk-taking (ERS)	3 (.777)	1.00 - 7.00	1.00 - 7.00	2.79 (1.54)
Kinship risk-taking (ERS)	3 (.678)	1.00 - 7.00	1.00 - 7.00	5.51 (1.27)
Mate attraction risk-taking (ERS)	3 (.648)	1.00 - 7.00	1.00 - 7.00	2.65 (1.41)
Mate retention risk-taking (ERS)	3 (.676)	1.00 - 7.00	1.00 - 6.00	2.04 (1.12)
Aggression (Overall)	8 (.906)	1.00 - 9.00	1.00 - 9.00	2.99 (1.79)
Direct Aggression	4 (.888)	1.00 - 9.00	1.00 - 9.00	2.80 (1.95)
Indirect Aggression	4 (.910)	1.00 - 9.00	1.00 - 9.00	2.88 (1.81)

Note. "ERS" – Evolutionary Risk Scale.

Table 4.4

Descriptive Statistics for 318 Participant Scores for the Measures of Personal Social Position, Including Score Range, Mean, and Standard Deviation

Numerical variables	Possible Score range	Score Range	*M* (*SD*)
Perceived personal position in society (ISSP)	1.00 - 10.00	1.00 - 9.00	4.88 (1.83)
Perceived family position in society (ISSP)	1.00 - 10.00	1.00 - 9.00	4.80 (1.87)
Rated income relative to others in UK (AB)	1.00 - 5.00	1.00 - 5.00	2.67 (.914)
Rated living conditions relative to others in UK (AB)	1.00 - 5.00	1.00 - 5.00	3.16 (.682)
Rated income relative to others in neighbourhood (AB)	1.00 - 5.00	1.00 - 5.00	2.76 (.863)
Rated living conditions relative to neighbourhood (AB)	1.00 - 5.00	1.00 - 5.00	3.06 (.708)

Note. "ISSP" – International Social Survey Programme; "AB" – Afrobarometer. Each measure consists of 1 item.

Table 4.5

The Frequency that Each UK Inequality Diagram was Chosen by 317 Participants to Most

Closely Represent the Shape of Society in the UK

Category	Description	Frequency
A	A small elite at the top, very few people in the middle and the great mass of people at the bottom.	80
B	A society like a pyramid with a small elite at the top, more people in the middle, and most at the bottom.	103
C	A pyramid except that just a few people are at the bottom.	68
D	A society with most people in the middle.	63
E	Many people near the top, and only a few near the bottom.	3

Note. Frequencies are shown for the diagrams chosen in response to the question, "These five diagrams show different types of society. Please read the descriptions and look at the diagrams below. What type of society is the United Kingdom today? Which diagram comes closest?". Diagrams can be seen in Figure 4.1.

Table 4.6

The Frequency that Each Neighbourhood Inequality Diagram was Chosen by 318 Participants to Most Closely Represent the Shape of their Local Area

Category	Description	Frequency
A	A small elite at the top, very few people in the middle and the great mass of people at the bottom.	67
B	A neighbourhood like a pyramid with a small elite at the top, more people in the middle, and most at the bottom.	71
C	A pyramid except that just a few people are at the bottom.	45
D	A neighbourhood with most people in the middle.	106
E	Many people near the top, and only a few near the bottom.	29

Note. Frequencies are shown for the diagrams chosen in response to the question, "Now think about the local area where you live (i.e. your neighbourhood). These five diagrams show different types of neighbourhood. Please read the descriptions and look at the diagrams below. Which diagram most closely resembles your neighbourhood today?". Diagrams can be seen in Figure 4.1.

Table 4.7

Tests of Normality for the Scale Variables CFC, Eysenck, Aggression, PRD and the Evolutionary Risk Scale Domains

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	p	Statistic	df	p
PRD	.057	318	.013	.987	318	.005
CFC	.055	318	.024	.992	318	.102
Eysenck	.142	318	<.001	.929	318	<.001
Overall aggression	.133	318	<.001	.914	318	<.001
Direct aggression	.185	318	<.001	.852	318	<.001
Indirect aggression	.149	318	<.001	.896	318	<.001
Between group competition (ERS)	.126	318	<.001	.924	318	<.001
Within group competition (ERS)	.079	318	<.001	.983	318	.001
Status power (ERS)	.263	318	<.001	.708	318	<.001
Environmental exploration (ERS)	.116	318	<.001	.927	318	<.001
Food selection (ERS)	.081	318	<.001	.986	318	.004
Food acquisition ERS)	.110	318	<.001	.965	318	<.001
Parent offspring (ERS)	.125	318	<.001	.919	318	<.001
Kinship (ERS)	.151	318	<.001	.904	318	<.001
Mate attraction (ERS)	.127	318	<.001	.922	318	<.001
Mate selection (ERS)	.176	318	<.001	.847	318	<.001

4.3.2. Bivariate Associations

Table 4.8 shows bivariate (Pearson's coefficient) associations for key scale variables, including PRD, CFC, impulsivity (EIS), key domains of the evolutionary risk scale, and aggression. Table 4.9 shows the bivariate associations using Spearman's rho between the single item measures of perceived personal social position and PRD, as well as the scale measures of the psychological risk factors for violence (CFC, EIS, and ERS measures relating to intrasexual competition). Full associations between all numerical variables (including ERS measures not related to intrasexual competition) can be seen in *Appendix J*.

Table 4.8

Bivariate (Pearson's) Associations Between PRD and Risk Factors for Violence for 318 Participants

Measure	Statistic	PRD	CFC	EIS	Between group competition (ERS)	Within group competition (ERS)	Status / power (ERS)	Overall aggression	Direct aggression
CFC	r	-.265	-	-	-	-	-	-	-
	p	<.001	-	-	-	-	-	-	-
EIS	r	.142	-.396	-	-	-	-	-	-
	p	.011	<.001	-	-	-	-	-	-
Between group competition (ERS)	r	.089	.191	.334	-	-	-	-	-
	p	.111	.001	<.001	-	-	-	-	-
Within group competition (ERS)	r	.009	.119	.139	.358	-	-	-	-
	p	.880	.033	.013	<.001	-	-	-	-
Status/power (ERS)	r	.234	-.226	.292	.459	.339	-	-	-
	p	<.001	<.001	<.001	<.001	<.001	-	-	-
Overall aggression	r	.177	-.171	.223	.314	.254	.414	-	-
	p	.002	.002	<.001	<.001	<.001	<.001	-	-
Direct aggression	r	.113	-.157	.281	.366	.244	.381	.877	-
	p	.044	.005	<.001	<.001	<.001	<.001	<.001	-
Indirect aggression	r	.189	-.157	.162	.274	.233	.385	.949	.710
	p	.001	.005	.004	<.001	<.001	<.001	<.001	<.001

Note. "PRD" – Personal Relative Deprivation; "CFC" – Consideration of Future Consequences; "EIS" – Eysenck's Impulsivity Scale; "ERS" – Evolutionary Risk Scale.

Table 4.9

Bivariate (Spearman's rho) Associations Between PRD and Risk Factors for Violence for 318 Participants

Measure	Statistic	PRD	CFC	EIS	Between group competition (ERS)	Within group competition (ERS)	Status / power (ERS)	Overall aggression	Direct aggression	Indirect aggression
Perceived personal position (ISSP)	r_s	-.438	.203	-.145	.009	.157	.040	.125	.123	.113
	p	<.001	<.001	.010	.876	.005	.482	.026	.029	.045
Perceived family position (ISSP)	r_s	-.250	.177	-.148	.075	.074	.061	.094	.129	.067
	p	<.001	.002	.008	.180	.190	.277	.096	.022	.231
Income relative to others in UK (AB)	r_s	-.368	.075	.050	.072	.135	.036	.090	.086	.081
	p	<.001	.180	.375	.203	.016	.521	.111	.124	.147
Living conditions relative to others in UK (AB)	r_s	-.376	.089	-.039	.079	.135	.034	.118	.076	.117
	p	<.001	.112	.493	.159	.016	.543	.035	.175	.037
Income relative to others in neighbourhood (AB)	r_s	-.340	.030	.008	.115	.067	-.009	.043	.057	.016
	p	<.001	.596	.881	.041	.236	.868	.444	.311	.770
Living conditions relative to neighbourhood (AB)	r_s	-.289	.127	-.080	.064	.030	-.064	.026	.003	.005
	p	<.001	.024	.153	.254	.594	.257	.647	.954	.929

Note. "PRD" – Personal Relative Deprivation; "CFC" – Consideration of Future Consequences; "EIS" – Eysenck's Impulsivity Scale; "ERS" – Evolutionary risk scale; "ISSP" – International Social Survey Program; "AB" – Afrobarometer.

4.3.2.1. PRD's Associations with Risk Factors for Violence

As predicted, PRD was positively associated with overall aggression (r (316) = .177, p = .002, *Figure 4.2, Panel A*), direct aggression (r (316) = .113, p = .044, *Figure 4.2, Panel B*), and indirect aggression scores (r (316) = .189, p = .001, *Figure 4.2, Panel C*); as well as with impulsivity scores (r (316) = .142, p = .011, *Figure 4.2, Panel D*). PRD showed the predicted negative association with consideration for future consequences (CFC) scores (r (316) = -.265, p<.001, *Figure 4.2, Panel E*). In the Pearson's tests between PRD and the Evolutionary Risk Scale (ERS) domains, PRD was positively associated with risk-taking scores in the status/power (r (316) = .234, p<.001, *Figure 4.2, Panel F*), and mate attraction (r (316) = .175, p = .002, *Appendix K, Figure 8.1*) domains, and negatively associated with risk taking scores in the food selection domain (r (316) = -.161, p = .004, *Appendix K, Figure 8.2*).

Figure 4.2

Association Between Personal Relative Deprivation (PRD) Scores and Risk-Factors for Violence
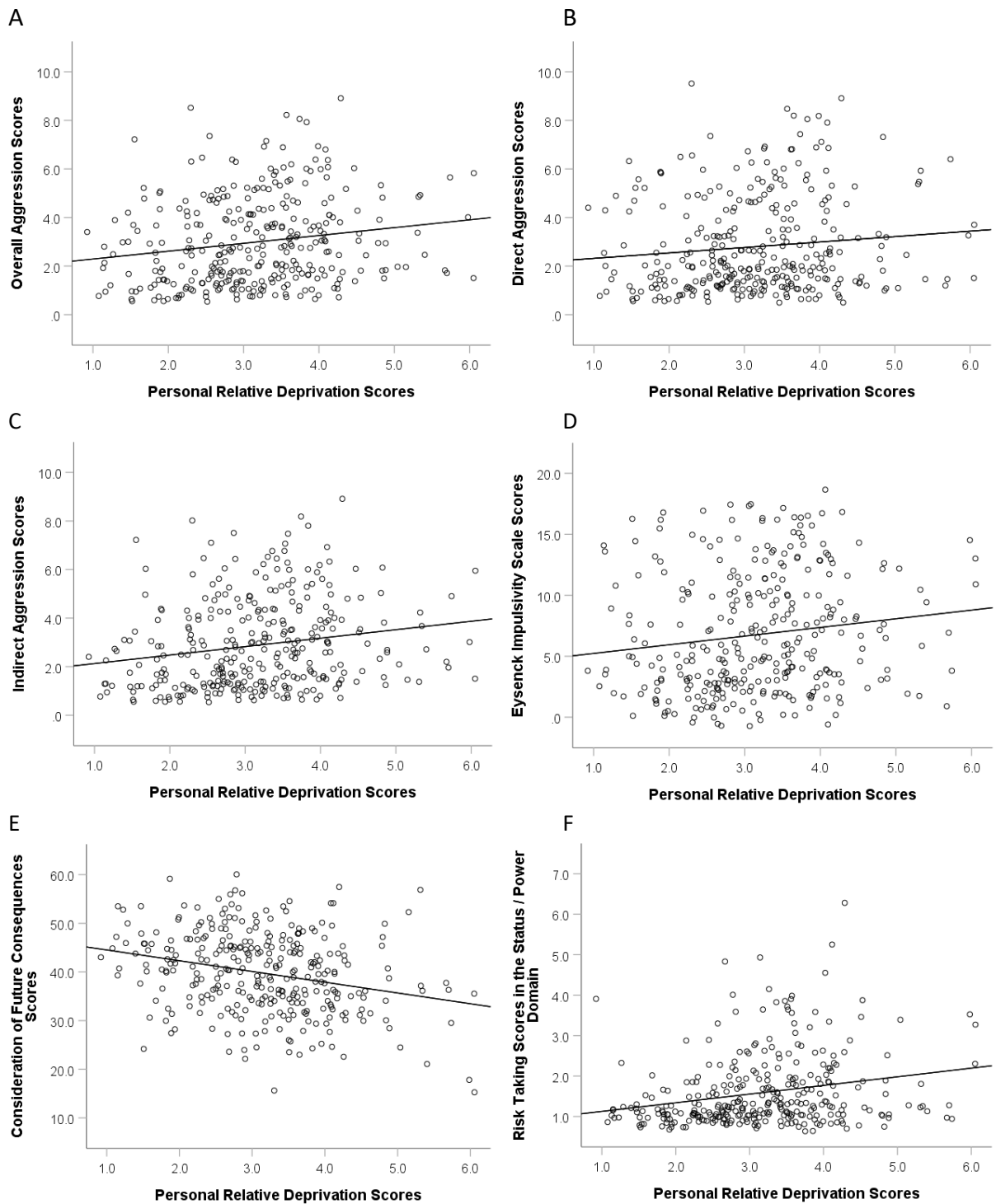
Note. Personal Relative Deprivation (PRD) scores were positively associated with direct aggression scores (Panel B; *r* (316) = .113, *p* = .044), and indirect aggression scores (Panel C; *r* (316) = .189, *p* = .001), giving an association with overall aggression of *r* (316) = .177, *p* = .002 (Panel A). PRD scores were also positively associated with impulsivity scores as

measures by the EIS (Panel D; r (316) = .142, p = .011); with risk-taking scores in the status/power domain (Panel F; r (316) = .234, p < .001); and were negatively associated with scores on the consideration of future consequences (CFC) scale (Panel E; r (316) = -.265, p < .001). Graphs include jitter to reveal overlapping scores.

4.3.2.2. *PRD's Associations with Perceptions of Social Position*

PRD scale scores were significantly associated with the Study 2 measures of perceived social position, so that those who felt more deprived rated themselves as significantly lower in the social distribution both currently (r_s (316) = -.438, p < .001), and in the family they grew up in (r_s (316) = -.250, p < .001); they rated their income as worse off relative to other in the UK (r_s (316) = -.368, p < .001), and their local neighbourhood (r_s (316) = -.340, p < .001); and rated their living conditions as worse off relative to others in the UK (r_s (316) = -.376, p < .001), and to others in their local neighbourhood (r_s (316) = -.289, p < .001). Figures showing the significant associations can be seen in *Appendix L*.

4.3.2.3. *Associations Between Aggression and Other Risk Factors for Violence*

Consistent with the predicted risk-factors for violence, overall aggression was negatively associated with CFC scores (r (316) = .171, p = .002, *Figure 4.3, Panel A*), and positively associated with EIS scores (r (316) = .223, p < .001, *Figure 4.3, Panel B*); as well as with risk taking scores in the in the between group competition (r (316) = .314, p < .001, *Figure 4.3, Panel C*); within group competition (r (316) = .254, p < .001, *Figure 4.3, Panel D*); and status/power domains (r (316) = .414, p < .001, *Figure 4.3, Panel E*). Although not predicted, additional positive associations were found between overall aggression and risk-taking in the environmental exploration (r (316) = .127, p = .024; *Appendix M, Figure 8.9*); food acquisition (r (316) = .189, p = .001; *Appendix M, Figure 8.10*); parent-offspring conflict (r (316) = .166, p = .003; *Appendix M, Figure 8.11*); mate attraction (r (316) = .297, p < .001; *Appendix M, Figure 8.12*); and mate retention (r (316) = .334, p < .001; *Appendix M, Figure 8.13*) domains. Overall aggression was negatively associated with risk-taking in the kinship domain (r (316) = -.134, p = .017). No association was found with risk-taking in the food selection domain (r (316) = -.055, p = .328).

Figure 4.3

Associations Between Overall Interpersonal Aggression and Other Risk-Factors for Violence
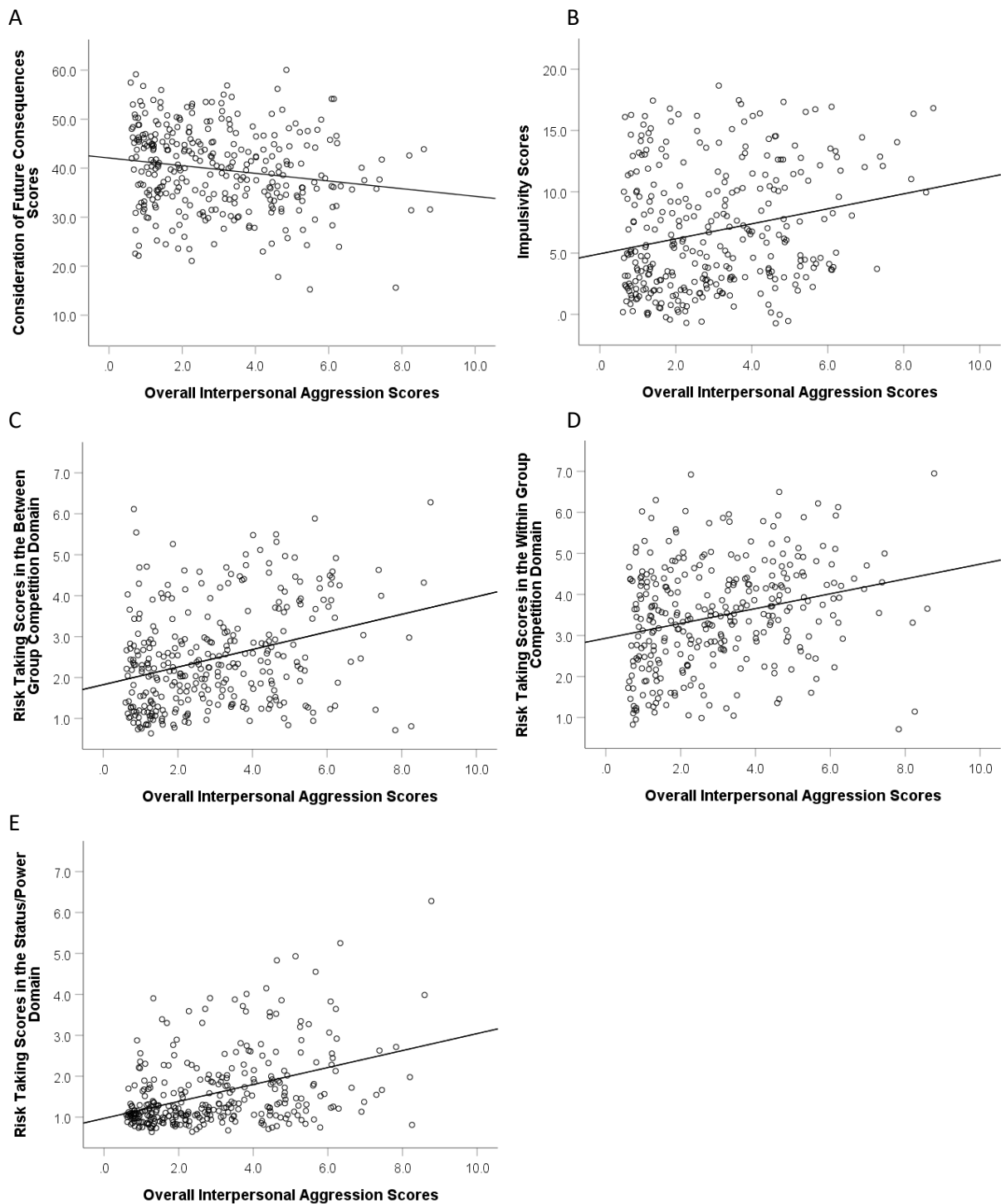
Note. Overall aggression scores were negatively associated with consideration of future consequences (CFC) scores (Panel A; r (316) = -.171, p = .002), and positively associated with impulsivity (EIS) scores (Panel B; r (316) = .223, p < .001); risk-taking scores in the between group competition domain (Panel C; r (316) = .314, p < .001); in the within group competition domain (Panel D; r (316) = .254, p < .001); and the status/power domain (Panel E; r (316) = .414, p < .001). Graphs include jitter to reveal overlapping scores.

4.3.2.4. *Associations Between Perceived Social Position and Risk Factors for Violence*

Contrary to findings in the previous study, several measures of perceived social position were found to be associated with risk factors for violence. Perceived current personal social position in society was positively associated with CFC scores (r_s (316) = .203, p < .001; *Figure 4.4, Panel A*), and negatively associated with EIS scores (r_s (316) = -.145, p < .010; *Figure 4.4, Panel C*); overall aggression scores (r_s (316) = .125, p = .026; *Figure 4.4, Panel E*), and with both of its subscales. Unexpected positive associations were found with both direct (r_s (316) = .123, p = .029; *Appendix N, Figure 8.14*) and indirect aggression scores (r_s (316) = .113, p = .045; *Appendix N, Figure 8.15*). No associations were found with any of the risk-taking domains.

Similarly, perceptions of previous family social position showed a weak positive association with CFC scores (r_s (316) = .177, p = .002; *Figure 4.4, Panel B*); and a negative association with EIS scores (r_s (316) = -.148, p = .008; *Figure 4.4, Panel D*). It also showed an unexpected positive association with direct aggression (r_s (316) = .129, p = .022; *Figure 4.4, Panel F*); but not overall (r_s (316) = .094, p = .096; *Appendix N, Figure 8.16*) or indirect aggression (r_s (316) = .067, p = .231 *Appendix N, Figure 8.17*) scores.

Some unexpected positive associations were found between the single item relative income and living condition questions, and risk-taking scores. Ratings of personal income relative to others in the UK were positively associated with risk-taking scores in the within group competition (r_s (316) = .135, p = .016; *Figure 4.5, Panel A*), and parent-offspring conflict (r_s (316) = .125, p = .025; *Appendix N, Figure 8.18*) domains. Ratings of living conditions relative to others in the UK were also positively associated with risk-taking scores in the within group competition (r_s (316) = .135, p = .016; *Figure 4.5, Panel B*), and parent-offspring conflict (r_s (316) = .125, p = .025; *Appendix N, Figure 8.19*) domains. Ratings of personal income relative to others in one's neighbourhood was positively associated with risk-taking scores in the between group competition domain (r_s (316) = .115, p = .041; *Figure 4.5, Panel C*). Ratings of personal living conditions relative to others in one's neighbourhood was positively associated with risk-taking in the mate attraction domain (r_s (316) = -.144, p = .010; *Appendix N, Figure 8.20*).

Figure 4.4

Associations Between Perceptions of Personal or Previous Family Social Position and Risk-Factors for Violence
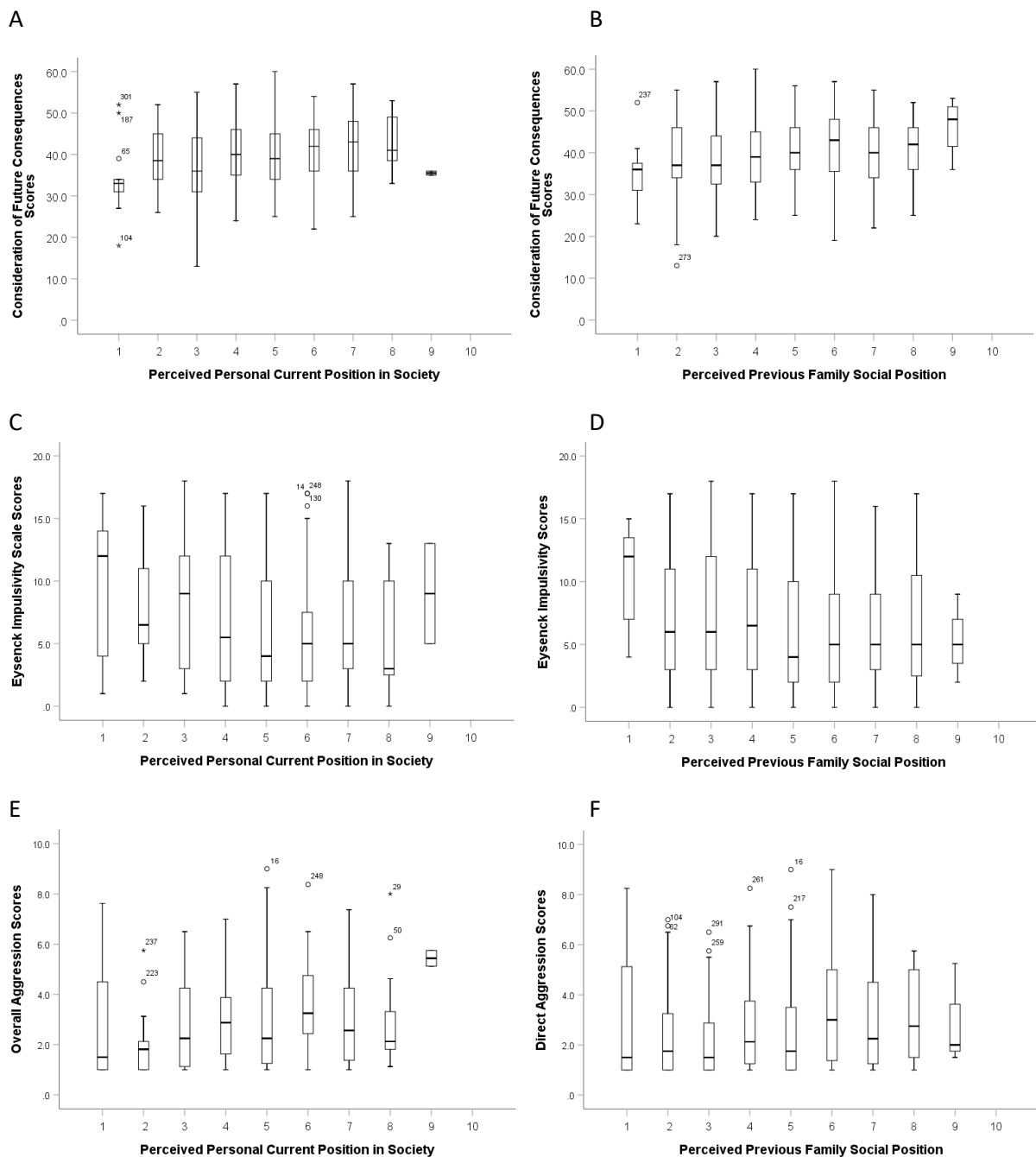
Note. For panels A, B, and C, participants are grouped according to their answer to the question "In our society there are groups which tend to be towards the top and groups which tend to be towards the bottom. Below is a scale that runs from top to bottom. Where would you put yourself now on this scale?". For Panels D, E, and F, participants are grouped according to how they ranked the family they grew up in on this same scale. Spearman's rho analyses showed that both current and previous family social position were associated with CFC scores (Current, Panel A, r_s (316) = .203, p < .001; Family, Panel B, r_s (316) = .177, p = .002); and impulsivity scores (Current, Panel C, r_s (316) = -.145, p < .010; Family, Panel D, r_s

(316) = -.148, *p* = .008). Current personal social position was associated with overall aggression scores (Panel E, r_s (316) = .125, *p* = .026). Family social position was associated with direct aggression scores (Panel F, r_s (316) = .123, *p* = .029). Boxplots show the median, first, and third interquartile ranges. Whiskers represent the minimum and maximum scores; excluding extreme values and outliers.

º Indicates outliers. Defined as between 1.5 and 3 IQR above quartile 3, or below quartile 1.

* Indicates extreme values. Defined as more than 3 IQR above quartile 3, or below quartile 1.

Figure 4.5

Associations Between Risk-Factors for Violence and Participants Ratings of Personal Income or Livings Conditions, Relative to Others (in the UK or Participants Local Neighbourhood)
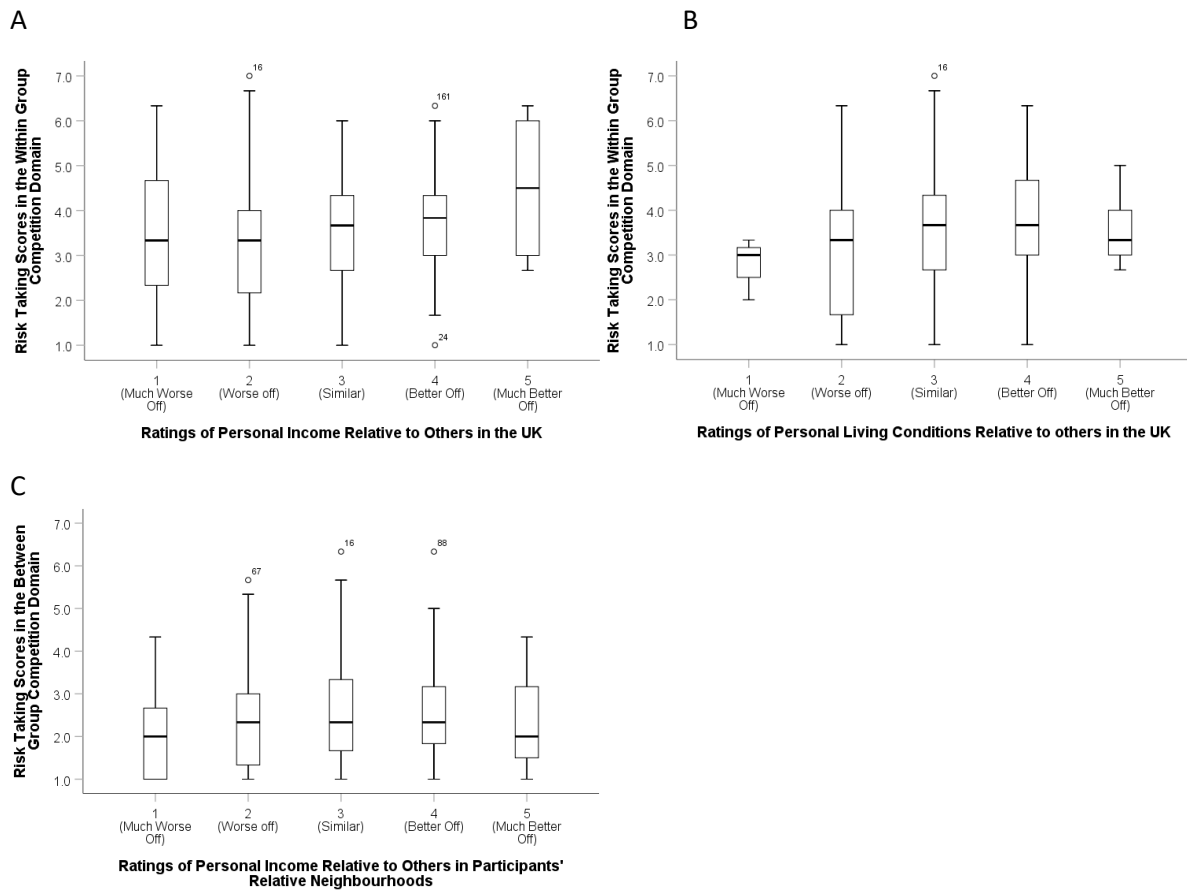
Note. Participants are grouped according to their answer to the question "In general, how do you rate your income/living conditions compared to those of other people in your local area / neighbourhood?". Spearman's rho tests showed that risk-taking scores in the within group competition domain were positively associated with ratings of personal income (Panel A; r_s (316) = .135, p = .016.), and of personal living conditions (Panel B; r_s (316) = .135, p = .016) relative to others in the UK. Risk-taking scores in the between group competition domain were associated with ratings of personal income relative to others in the participants local neighbourhoods (Panel C; r_s (316) = .115, p = .041). Boxplots show the median, first, and third interquartile ranges. Whiskers represent the minimum and maximum scores; excluding extreme values and outliers.

° Indicates outliers. Defined as between 1.5 and 3 IQR above quartile 3, or below quartile 1.

4.3.3. Perceptions of UK Inequality

ANOVAs were carried out to compare differences in aggression, CFC, impulsivity, and risk-taking between those who chose different diagrams as most closely representing the socioeconomic distribution in the UK. In order to retain power, the 3 participants that chose category E (see *Table 4.5*) were excluded from the ANOVAs in which perceived UK inequality was a factor. This left a total of 314 participants. Gabriel's test was applied to the ANOVA analyses to adjust for unequal sample sizes between groups, in case of post-hoc tests. Scale descriptive statistics for each group (excluding some of the less relevant ERS domains) are shown in Table 4.10. Full descriptive statistics for all scales and domains can be seen in *Appendix O*.

Table 4.10

The Means and Standard Deviations for the CFC, Impulsivity, Aggression, PRD and the Domains of the Evolutionary Risk Scale for Participants who Chose Diagrams A, B, C, and D as Most Closely Representing the Socioeconomic Distribution in the UK

Scale variables	Diagram A M (SD)	Diagram B M (SD)	Diagram C M (SD)	Diagram D M (SD)
CFC	39.44 (8.05)	38.87 (7.91)	40.34 (8.69)	41.00 (8.25)
Impulsivity	7.70 (5.16)	7.18 (5.11)	4.99 (4.32)	6.59 (4.41)
Aggression (Overall)	2.89 (1.74)	2.98 (1.89)	2.99 (1.86)	3.05 (1.63)
Direct Aggression	2.72 (1.91)	2.84 (2.04)	2.70 (1.96)	2.87 (1.81)
Indirect Aggression	2.75 (1.73)	2.87 (1.94)	2.93 (1.83)	2.92 (1.65)
Between group competition (ERS)	2.46 (1.28)	2.64 (1.26)	2.21 (1.07)	2.46 (1.24)
Within group competition (ERS)	3.45 (1.37)	3.48 (1.30)	3.51 (1.19)	3.46 (1.21)
Status/power (ERS)	1.63 (.861)	1.57 (.939)	1.53 (.809)	1.36 (.890)
PRD	17.31 (5.17)	15.56 (4.56)	15.58 (4.86)	14.02 (4.78)

There were significant differences between group impulsivity scores, $F(3, 310) =$ 4.36, $p = .005$, $\eta p^2 = .041$. Post-hoc tests indicated that participants who chose group C ($M =$ 4.99, $SD = 4.32$) had significant lower impulsivity scores than those who chose groups A ($M =$ 7.70, $SD = 5.16$), p = .004; and B ($M = 7.18$, $SD = 5.11$), $p = .021$ (see *Figure 4.6*).

Figure 4.6

Mean Impulsivity Scores on Eysenck's Impulsivity Scale (EIS) for Those who Chose Diagrams A, B, C, And D as Most Closely Representing the UK Socioeconomic Distribution
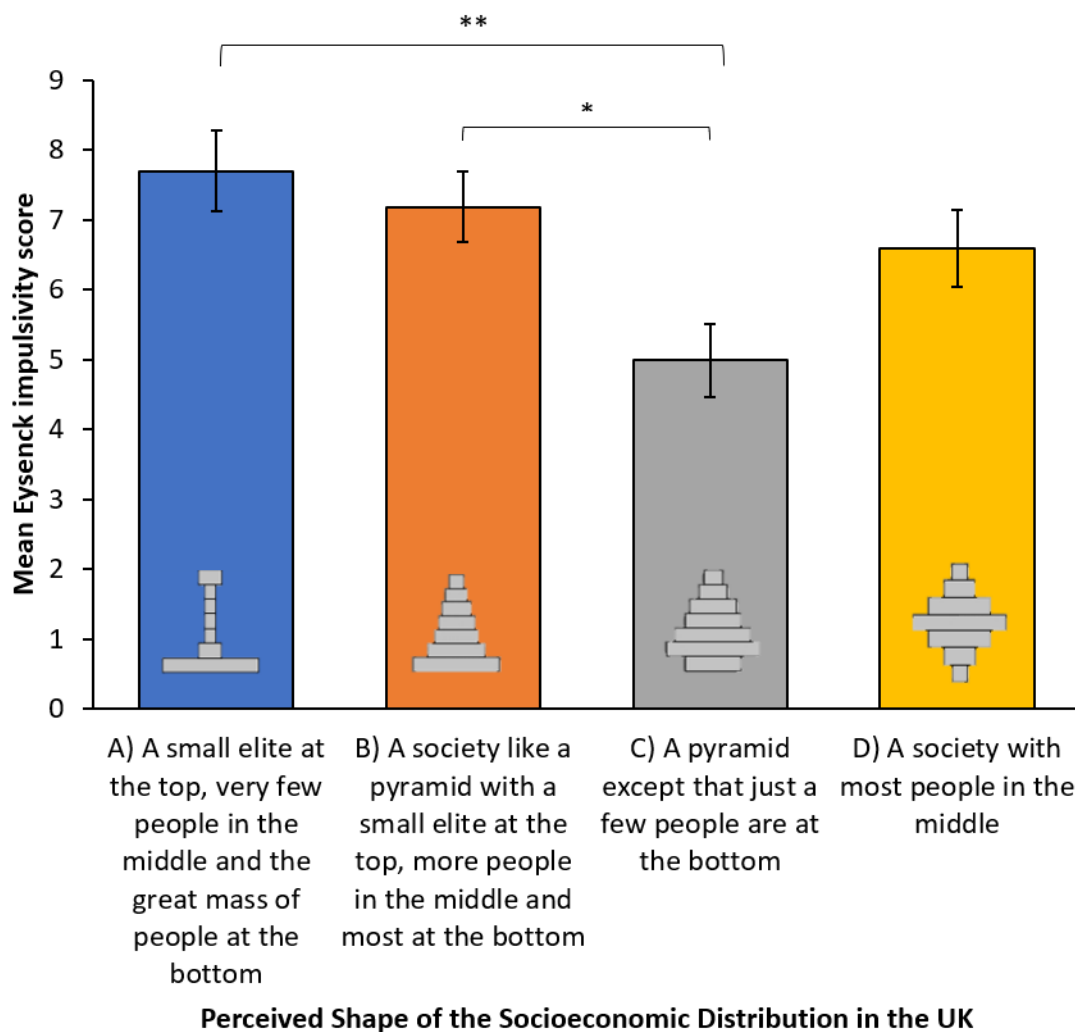
Note. Error bars depict *SE*. * indicates $p \leq .05$; ** indicates $p \leq .01$

No significant difference was found between group CFC scores, $F(3, 310) = 1.04$, $p = .376$; overall aggression scores $F(3, 310) = 0.11$, $p = .957$, or it's subscales, direct, $F(3, 310) = .143$, $p = .934$, and indirect aggression, $F(3, 310) = .163$, $p = .921$). No significant differences were found in risk-taking in the between group, $F(3, 310) = 1.67$, $p = .174$; within-group competition, $F(3, 310) = 0.04$, $p = .989$; status/power $F(3, 310) = 0.17$, $p = .920$; environmental exploration, $F(3, 310) = 0.08$, $p = .972$; food selection, $F(3, 310) = 0.25$, $p = .865$; food acquisition, $F(3, 310) = 0.61$, $p = .608$; parent-offspring conflict, $F(3, 310) = 0.58$, $p = .628$; kinship, $F(3, 310) = 0.69$, $p = .560$; mate attraction, $F(3, 310) = 2.36$, $p = .071$; or mate selection, $F(3, 310) = 0.53$, $p = .660$, domains.

To see if there was any relationship between feelings of personal deprivation and perceptions of the UK socioeconomic distribution, an ANOVA was also carried out on PRD scores between groups. A significant effect of group was found on PRD score, $F(3, 310) = 5.48$, $p = .001$, $\eta p^2 = .050$. Post-hoc tests indicated that those who chose group A($M = 17.31$, $SD = 5.17$) felt significantly more deprived than those who chose group D ($M = 14.02$, $SD = 4.78$), $p < .001$ (*Figure 4.7*).

Figure 4.7

Mean Personal Relative Deprivation Scores for Those Who Chose Diagrams A, B, C, And D as Most Closely Representing the UK Socioeconomic Distribution
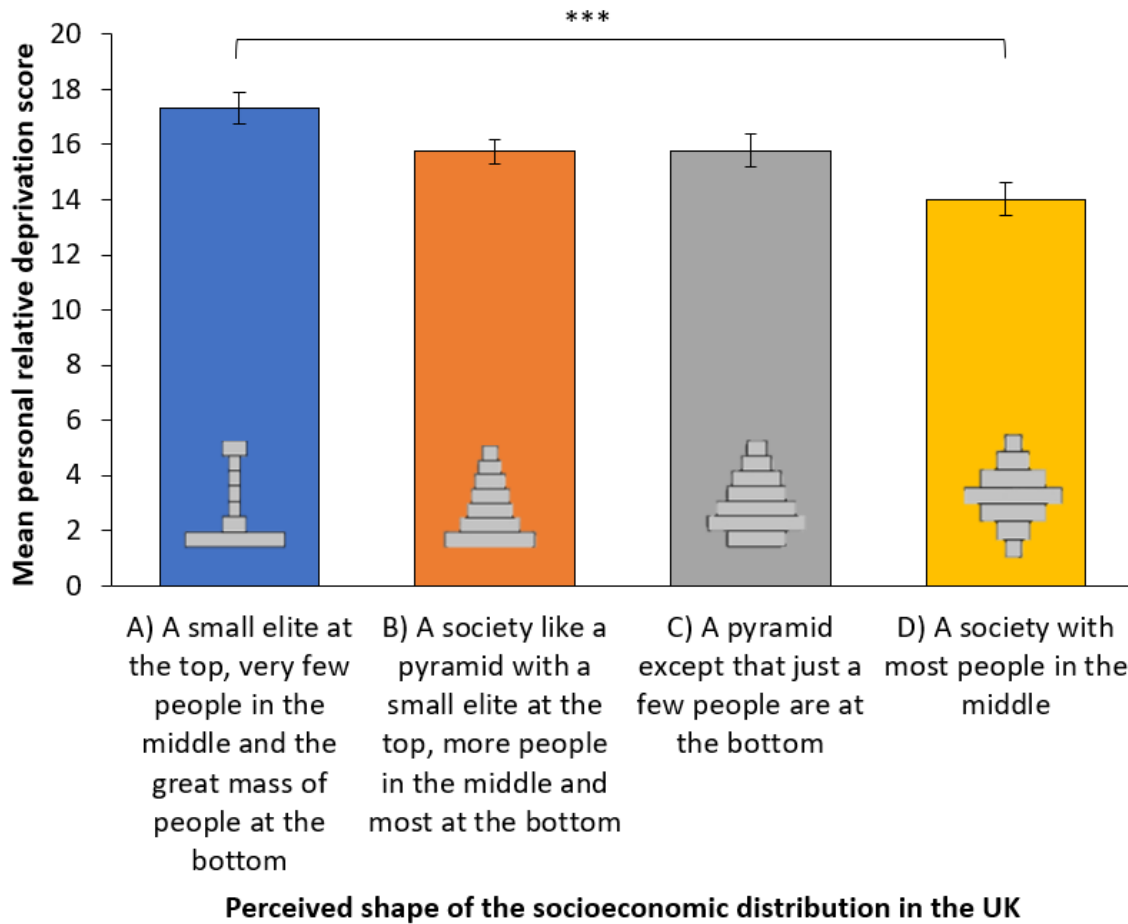
Note. Error bars depict SE. *** indicates p≤.001.

4.3.4. Perceptions of Local Inequality

ANOVAs were carried out to compare differences in aggression, CFC, impulsivity, and risk-taking between those who chose different diagrams as most closely representing the socioeconomic distribution in their local neighbourhood. Gabriel's test was applied to the ANOVA analyses to adjust for unequal sample sizes between groups, in case of post-hoc tests. Scale descriptive statistics for each group are shown in Table 4.11.

Table 4.11

The Means and Standard Deviations for the CFC, Impulsivity, Aggression, PRD and the Domains of the Evolutionary Risk Scale for Participants who Chose Diagrams A, B, C, D, and E as Most Closely Representing the Socioeconomic Distribution in Their Local Neighbourhood

Scale variables	Diagram A M (SD)	Diagram B M (SD)	Diagram C M (SD)	Diagram D M (SD)	Diagram E M (SD)
CFC	39.12(8.66)	39.93 (8.03)	40.27 (8.80)	40.15(8.01)	38.78 (7.14)
EIS	6.78 (4.96)	6.77 (4.78)	7.67 (5.35)	6.24 (4.63)	7.31 (5.31)
Aggression (Overall)	3.05 (1.99)	2.66 (1.69)	3.17 (1.69)	3.18 (1.85)	2.70 (1.36)
Direct Aggression	2.87 (2.18)	2.52 (1.84)	3.16 (1.86)	2.91 (2.00)	2.42 (1.52)
Indirect Aggression	2.95 (1.96)	2.54 (1.69)	2.91 (1.72)	3.10 (1.90)	2.72 (1.43)
Between group competition (ERS)	2.33 (1.27)	2.55 (1.23)	2.59 (1.27)	2.52 (1.14)	2.24 (1.34)
Within group competition (ERS)	3.37 (1.36)	3.34 (1.30)	3.42 (1.06)	3.71 (1.26)	3.23 (1.28)
Status/power (ERS)	1.62 (.929)	1.48 (.883)	1.55 (.729)	1.64 (.892)	1.68 (1.11)
PRD	17.18(5.08)	15.96 (4.93)	16.22 (4.24)	14.78(4.90)	15.45 (4.83)

Note. "ERS"- Evolutionary risk scale.

No significant difference was found between group CFC scores, $F(4, 313) = 0.42$, $p = .795$; impulsivity, $F(4, 313) = 0.78$, $p = .540$; overall aggression scores $F(4, 313) = 1.23$, $p = .296$, or it's subscales, direct, $F(4, 313) = 1.13$, $p = .343$, and indirect aggression, $F(4, 313) = 1.12$, $p = .353$). No significant differences were found in risk-taking in the between group competition, $F(4, 313) = 0.68$, $p = .603$; within-group competition, $F(4, 313) = 1.52$, $p = .198$; status/power $F(4, 313) = 0.46$, $p = .767$; environmental exploration, $F(4, 313) = 1.64$, $p = .163$; food selection, $F(4, 313) = 0.67$, $p = .612$; food acquisition, $F(4, 313) = 0.46$, $p = .763$; parent-offspring conflict, $F(4, 313) = 0.85$, $p = .494$; kinship, $F(4, 313) = 1.58$, $p = .180$; mate attraction, $F(4, 313) = 1.82$, $p = .126$; or mate selection, $F(4, 314) = 2.13$, $p = .077$, domains.

To see if there was any relationship between feelings of personal relative deprivation and perceptions of the local socioeconomic distribution, an ANOVA was also carried out on PRD scores between groups. A significant effect of group was found on PRD score, $F(4, 313) = 2.66$, $p = .033$, $\eta p^2 = .033$. Post-hoc tests indicated that those who chose group A ($M = 17.18$, $SD = 5.08$) felt significantly more deprived than those who chose group D ($M = 14.78$, $SD = 4.90$), $p = .016$ (see *Figure 4.8*).

Figure 4.8

Mean Personal Relative Deprivation Scores for Those Who Chose Diagrams A, B, C, and D as Most Closely Representing the Local Socioeconomic Distribution
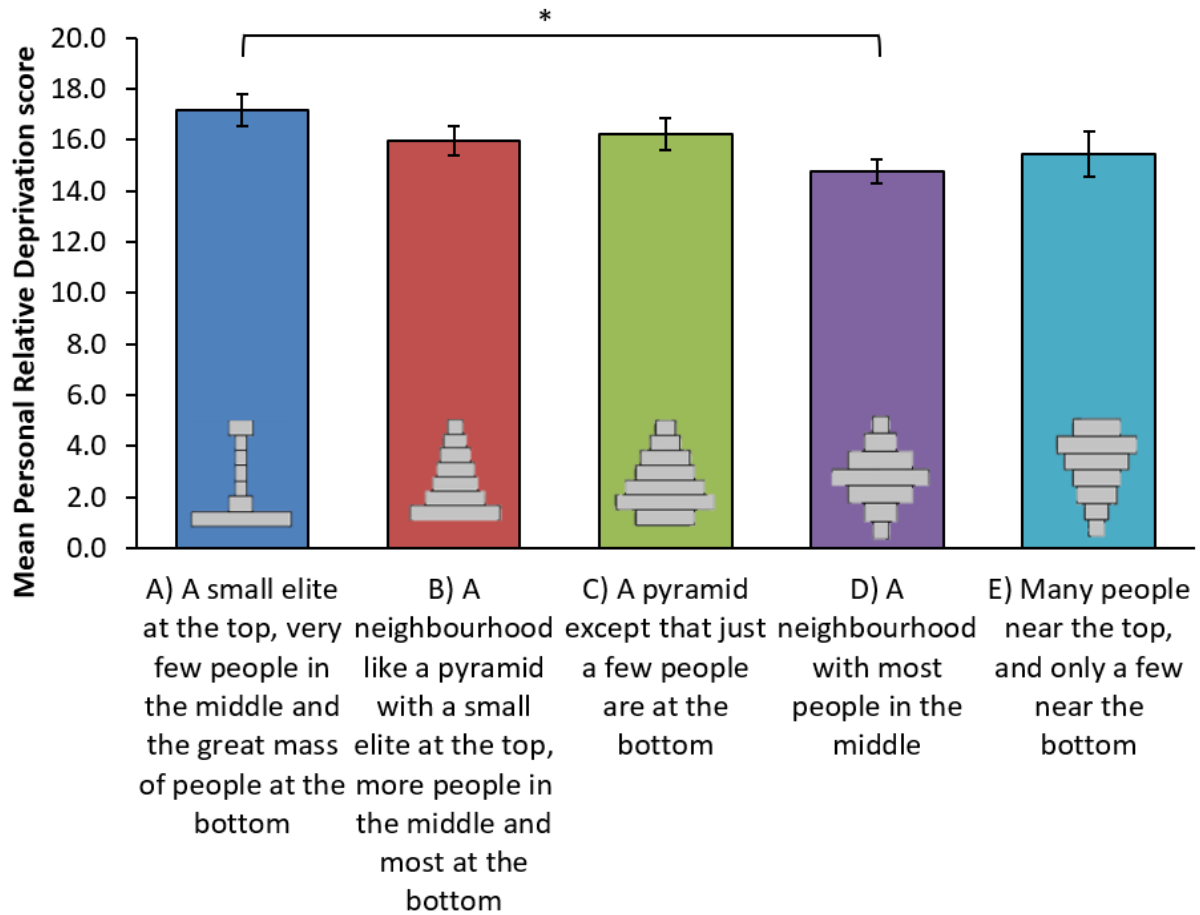
Note. Error bars depict ±SE. * indicates p≤.05

4.3.5. PRD Versus Perceptions of UK Inequality as Predictors of Risk Factors for Violence

In order to test the main hypotheses and compare PRD and perceptions of inequality as predictors of the risk-factors for violence, ANCOVAs were conducted on each of the risk factors for violence with perceptions of UK inequality as the independent factor, and PRD as a covariate. Only participants who chose diagrams A-D were included in analyses.

4.3.5.1. Impulsivity

When looking at perceived UK inequality as the independent factor, PRD scale scores as a covariate, and Eysenck's et al (1985) impulsivity scale scores as the dependent, ANCOVA analysis showed that both perceived inequality, $F(3, 309) = 4.00$, $p = .008$, and personal relative deprivation, $F(1, 309) = 5.37$, $p = .021$, were significant predictors of impulsivity. However, when an interaction term was included, $F(3, 306) = 0.99$, $p = .400$), only PRD remained a significant predictor, $F(1, 306) = 5.37$, $p = .021$, with the effect of perceived UK inequality no longer reaching significance, $F(3, 306) = 1.87$, $p = .134$. Full ANCOVA results can be seen in Table 4.12.

Table 4.12

ANCOVAS With and Without an Interaction Term for Personal Relative Deprivation (PRD) and Perceived Shape of the UK Socioeconomic Distribution as Predictors for Impulsivity

	Type III Sum of Squares	*df*	Mean Square	*F*	*p*	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	428.11	4	107.03	4.66	.001	.057	.948	.057	.045
Perception of UK inequality	275.44	3	91.81	4.00	.008	.037	.835		
PRD	123.32	1	123.32	5.37	.021	.017	.637		
Error	7095.23	309	22.96						
Model 2									
Corrected Model	495.99	7	70.86	3.09	.004	.066	.942	.066	.045
Perception of UK inequality	129.13	3	43.05	1.87	.134	.018	.484		
PRD	123.34	1	123.34	5.37	.021	.017	.637		
Perception of UK inequality * PRD	67.88	3	22.63	0.99	.400	.010	.268		
Error	7027.35	306	22.97						

4.3.5.2. CFC

When looking at perceived UK inequality as the independent factor, PRD scores as a covariate, CFC as the dependent, and the inclusion of an interaction term, only a significant effect of PRD was found, $F(1, 306) = 24.21$, $p < .001$, $\eta p^2 = .073$. Full ANCOVA results can be seen in Table 4.13.

Table 4.13

ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation (PRD) and Perceived Shape of the UK Socioeconomic Distribution as Predictors for CFC

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	1601.20	4	400.30	6.38	<.001	.076	.990	.076	.064
Perception of UK inequality	128.85	3	42.95	0.68	.560	.007	.194		
PRD	1392.39	1	1392.39	22.19	<.001	.067	.997		
Error	19391.88	309	62.76						
Model 2									
Corrected Model	1856.87	7	265.27	4.24	<.001	.088	.989	.088	.068
Perception of UK inequality	288.37	3	96.12	1.54	.205	.015	.404		
PRD	1514.06	1	1514.06	24.21	<.001	.073	.998		
Perception of UK inequality * PRD	255.67	3	85.22	1.36	.254	.013	.362		
Error	19136.21	306	62.54						

4.3.5.3. Overall Aggression

When looking at perceived UK inequality as the independent factor, PRD scores as a covariate, and overall aggression scores as the dependent, only PRD was a significant predictor, $F(1, 309) = 11.61$, $p = .001$, $\eta p^2 = .036$. With the inclusion of an interaction term, the overall model was no longer significant, $F(7, 306) = 1.80$, $p = .087$, $\eta p^2 = .040$, despite PRD still appearing to have a significant effect, $F(1, 306) = 11.78$, $p = .001$, $\eta p^2 = .037$. Full ANCOVA results can be seen in Table 4.14.

Table 4.14

ANCOVAs With and Without an interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictors for Overall Aggression Scores

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	37.17	4	9.29	2.98	.019	.037	.793	037	.025
Perception of UK inequality	5.39	3	1.80	0.58	.630	.006	.169		
PRD	36.16	1	36.16	11.61	.001	.036	.925		
Error	962.31	309	3.11						
Model 2									
Corrected Model	39.53	7	5.65	1.80	.087	.040	.724	.040	.018
Perception of UK inequality	1.61	3	0.54	0.17	.916	.002	.081		.081
PRD	36.95	1	36.95	11.78	.001	.037	.928		.928
Perception of UK inequality * PRD	2.36	3	0.79	0.25	.861	.002	.097		.097
Error	959.95	306	3.14						

4.3.5.4. Direct Aggression

When looking at perceived UK inequality as the independent factor, PRD scores as a covariate, direct aggression scores as the dependent, and the inclusion of an interaction term, only a significant effect of PRD was found, $F(1, 306) = 4.98$, $p = .026$, $\eta p^2 = .016$. Full ANCOVA results can be seen in Table 4.15.

Table 4.15

ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictors for Direct Aggression Scores

	Type III Sum of Squares	*df*	Mean Square	*F*	*p*	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	19.63	4	4.91	1.31	.265	.017	.409	.017	.004
Perception of UK inequality	4.19	3	1.40	0.37	.772	.004	.123		
PRD	18.01	1	18.01	4.82	.029	.015	.590		
Error	1154.85	309	3.74						
Model 2									
Corrected Model	27.27	7	3.90	1.04	.403	.023	.448	.023	.001
Perception of UK inequality	9.37	3	3.12	0.83	.476	.008	.230		
PRD	18.68	1	18.68	4.98	.026	.016	.605		
Perception of UK inequality * PRD	7.64	3	2.55	0.68	.565	.007	.193		
Error	1147.20	306	3.75						

4.3.5.5. Indirect Aggression

When looking at perceived UK inequality as the independent factor, PRD scores as a covariate, indirect aggression scores as the dependent, and the inclusion of an interaction term, only a significant effect of PRD was found, $F(1, 306) = 13.72$, $p < .001$, $\eta p^2 = .043$. Full ANCOVA results can be seen in Table 4.16.

Table 4.16

ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictors for Indirect Aggression Scores

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	43.55	4	10.89	3.45	.009	.043	.855	.043	.030
Perception of UK inequality	6.66	3	2.22	0.70	.551	.007	.199		
PRD	41.95	1	41.95	13.28	<.001	.041	.953		
Error	976.19	309	3.16						
Model 2									
Corrected Model	46.37	7	6.62	2.08	.045	.045	.797	.045	.024
Perception of UK inequality	0.80	3	0.27	0.08	.969	.001	.065		
PRD	43.63	1	43.63	13.72	<.001	.043	.958		
Perception of UK inequality * PRD	2.82	3	0.94	0.30	.829	.003	.107		
Error	973.37	306	3.18						

4.3.5.6. Between Group Competition Risk

When looking at perceived UK inequality as the independent factor, PRD scores as a covariate, and risk scores in the between group competition domain as the dependent, no significant effects were found, $F(4, 309) = 1.93$, $p = .105$, $\eta p^2 = .024$. However, with the inclusion of an interaction term, a significant effect of perceived UK inequality, $F(3, 306) = 2.75$, $p = .043$, $\eta p^2 = .026$ was found, as well as a significant interaction between perceived UK inequality and PRD, $F(3, 306) = 3.21$, $p = .023$, $\eta p^2 = .031$. Full ANCOVA results can be seen in Table 4.17. Considering the violation of homogeneity of regression slopes (as indicated by the significant interaction between the predictor and covariate variables), these results should be interpreted with some caution. However, it is also noted that the interaction effect is weak.

Table 4.17

ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictors for Risk-Taking Scores in the Between Group Competition Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	11.48	4	2.87	1.93	.105	.024	.580	.024	.012
Perception of UK inequality	7.65	3	2.55	1.72	.164	.016	.447		
PRD	4.02	1	4.02	2.70	.101	.009	.374		
Error	459.05	309	1.49						
Model 2									
Corrected Model	25.50	7	3.64	2.51	.016	.054	.877	.054	.033
Perception of UK inequality	12.00	3	4.00	2.75	.043	.026	.663		
PRD	4.44	1	4.44	3.05	.082	.010	.414		
Perception of UK inequality * PRD	14.02	3	4.67	3.21	.023	.031	.738		
Error	445.03	306	1.45						

Post-hoc regression analyses indicated that PRD was only significantly associated with risk-taking scores in the between group competition domain for those who chose diagram B as most closely representing the UK socioeconomic distribution, $F(1, 101) = 6.83$, $p = .010$, with a positive association between feelings of deprivation and risk-taking scores in the between group competition domain, $r = .252$, $p = .005$. Full post-hoc regression results can be seen in Table 4.18. However, when adjusting the alpha level for multiple comparisons (Bonferroni, requiring an alpha level of 0.0125 to reach significance), there appeared to be no significant associations between PRD and risk-taking (in the between group competition domain) for any of the groups.

Table 4.18

Post-hoc regression results PRD as a predictor of risk-taking scores in the Between Group Competition Domain for Each Group of Participants Who Chose Diagrams A-D as Most Representative of the UK Socioeconomic Distribution

	β	Standardised β	F	p	R^2	Adjusted R^2
Diagram A	-.041	-.164	2.17	.145	.027	.015
Diagram B	.069	.252	6.83	.010	.063	.054
Diagram C	.046	.209	3.01	.088	.044	.029
Diagram D	.026	.100	0.62	.433	.010	-.006

4.3.5.7. *Within Group Competition Risk*

When looking at perceived UK inequality as the independent factor, PRD scores as a covariate, and risk scores in the between group competition domain as the dependent, no significant effects were found in models, either including, $F(7, 306) = 0.13$, $p = .996$, $\eta p^2 = .003$, or excluding the interaction term $F(4, 309) = 0.04$, $p = .997$, $\eta p^2 = .001$. Full ANCOVA results can be found in Table 4.19.

Table 4.19

ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictors for Risk-Taking Scores in the Within Group Competition Domain

	Type III Sum of Squares	*df*	Mean Square	*F*	*p*	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	0.27	4	0.07	0.04	.997	.001	.058	.001	-.012
Perception of UK inequality	0.22	3	0.07	0.04	.988	<.001	.058		
PRD	0.06	1	0.06	0.04	.849	<.001	.054		
Error	507.81	309	1.64						
Model 2									
Corrected Model	1.47	7	0.21	0.13	.996	.003	.084	.003	-.020
Perception of UK inequality	0.94	3	0.31	0.19	.904	.002	.085		
PRD	0.07	1	0.07	0.04	.839	<.001	.055		
Perception of UK inequality * PRD	1.20	3	0.40	0.24	.867	.002	.096		
Error	506.60	306	1.66						

4.3.5.8. *Status/Power Risk*

When looking at perceived UK inequality as the independent factor, PRD scores as a covariate, risk-taking scores in the status/power domain as the dependent, and the inclusion of an interaction term, there was a significant effect of PRD, $F(1, 306) = 15.03$, $p < .001$, $\eta p^2 = .063$. The interaction between PRD and perceptions of UK inequality was close to significant, $F(3, 306) = 2.55$, $p = .056$, $\eta p^2 = .024$. Full ANCOVA results can be seen in Table 4.20.

Table 4.20

ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictors for Risk-Taking Scores in the Status/Power Domain

	Type III Sum of Squares	*df*	Mean Square	*F*	*p*	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	14.24	4	3.56	4.83	.001	.059	.955	.059	.047
Perception of UK inequality	0.59	3	0.20	0.27	.849	.003	.101		
PRD	13.85	1	13.85	18.79	<.001	.057	.991		
Error	227.71	309	0.74						
Model 2									
Corrected Model	19.78	7	2.83	3.89	<.001	.082	.982	.082	.061
Perception of UK inequality	4.39	3	1.46	2.02	.112	.019	.516		
PRD	15.03	1	15.03	20.70	<.001	.063	.995		
Perception of UK inequality * PRD	5.55	3	1.85	2.55	.056	.024	.625		
Error	222.17	306	0.73						

Post-hoc regression analyses indicated that PRD was significantly associated with risk-taking scores in the status/power domain for those who chose diagrams B (a pyramid with a small elite at the top, more people in the middle and most at the bottom), $F(1, 101) =$ 9.82, $p = .002$, and D (a society with most people in the middle), $F(1, 61) = 14.32$, $p < .001$, as most closely representing the UK socioeconomic distribution. There was an association between higher feelings of deprivation and higher risk-taking scores in the status/power domain, for both of these groups, with a stronger association in group D, $r = .436$, $p < .001$, than in group B, $r = .298$, $p = .001$. Full post-hoc regression results can be seen in Table 4.21.

Table 4.21

Post-Hoc Regression Results PRD as a Predictor of Risk-Taking Scores in the Status/Power Domain for Each Group of Participants who Chose Diagrams A-D as Most Representative of the UK Socioeconomic Distribution

	B	Standardised β	F	p	R^2	Adjusted R^2
Diagram A	.007	.044	0.15	.696	.002	-.011
Diagram B	.061	.298	9.82	.002	.089	.080
Diagram C	.035	.212	3.12	.082	.045	.031
Diagram D	.445	.436	14.32	<.001	.190	.177

ANCOVAs reports for UK diagram choices as a predictive factor, and PRD as a covariate, for risk-taking scores in the environmental exploration, food selection, food acquisition, parent offspring conflict, kinship, mate attraction, and mate selection risk domains can be seen in *Appendix P*.

4.3.6. PRD versus perceptions of local inequality as predictors of risk factors for violence

In order to test the main hypotheses and compare PRD and perceptions of inequality as predictors of the risk-factors for violence, ANCOVAs were conducted on each of the risk factors for violence with PRD and perceptions of local inequality. Only participants who chose diagrams A-D were included in analyses.

4.3.6.1. Impulsivity

When looking at perceived local inequality as the independent factor, PRD scores as a covariate, and impulsivity scores as the dependent, ANCOVA analysis indicated that models were not significant; either with, $F(7, 281) = 1.37$, $p = .217$, $\eta p^2 = .033$, or without the inclusion of the interaction term, $F(4, 284) = 1.86$, $p = .118$, $\eta p^2 = .026$. However, as seen in Table 4.22, the model excluding the interaction term did indicate a significant effect of PRD, $F(1, 284) = 4.63$, $p = .032$, $\eta p^2 = .016$. Full results of the ANCOVAs can be seen in Table 4.22.

Table 4.22

ANCOVAs with and without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the Local Socioeconomic Distribution as Predictors for Impulsivity Scores

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	173.65	4	43.41	1.86	.118	.026	.561	.026	.012
Perception of local inequality	49.98	3	16.66	0.71	.545	.007	.201		
PRD	108.05	1	108.05	4.63	.032	.016	.573		
Error	6635.09	284	23.36						
Model 2									
Corrected Model	224.88	7	32.13	1.37	.217	.033	.580	.033	.009
Perception of local inequality	58.86	3	19.62	0.84	.474	.009	.231		
PRD	70.68	1	70.68	3.02	.084	.011	.410		
Perception of local inequality * PRD	51.24	3	17.08	0.73	.535	.008	.205		
Error	6583.85	281	23.43						

4.3.6.2. CFC

Similarly to when looking at perceptions of UK inequality; when looking at perceived local inequality as the independent factor, PRD scores as a covariate, CFC as the dependent, and the inclusion of an interaction term, only a significant effect of PRD was found, $F(1, 281) = 15.70$, $p < .001$, $\eta p^2 = .053$. Full ANCOVA results can be seen in Table 4.23.

Table 4.23

ANCOVAs with and without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the Local Socioeconomic Distribution as Predictors for CFC Scores

	Type III Sum of Squares	*df*	Mean Square	*F*	*p*	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	1540.45	4	385.11	6.04	<.001	.078	.985	.078	.065
Perception of local inequality	21.72	3	7.24	0.12	.952	.001	.070		
PRD	1487.02	1	1487.02	23.31	<.001	.076	.998		
Error	18117.06	284	63.79						
Model 2									
Corrected Model	1685.72	7	240.82	3.77	.001	.086	.978	.086	.063
Perception of local inequality	107.96	3	35.99	0.56	.640	.006	.166		
PRD	1003.98	1	1003.98	15.70	<.001	.053	.977		
Perception of local inequality * PRD	145.27	3	48.42	0.76	.519	.008	.212		
Error	17971.80	281	63.96						

4.3.6.3. Overall Aggression

When looking at perceived local inequality as the independent factor, PRD as a covariate, overall aggression as the dependent, and an interaction term, a significant effect of PRD was found, $F(1, 281) = 9.60$, $p = .002$, $\eta p^2 = .033$. In contrast to the ANCOVA comparing PRD with perceptions of UK inequality, the interaction term between PRD and perceptions of local inequality was approaching significance $F(3, 281) = 2.51$, $p = .059$, $\eta p^2 = .026$. Full ANCOVA results can be seen in Table 4.24. The close to significant interaction term suggests a possible violation of the homogeneity of regression slopes assumption, so these results should be interpreted with some caution. However, PRD does appear to be a highly significant predictor of overall aggression.

Table 4.24

ANCOVAs with and without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the Local Socioeconomic Distribution as Predictors for Overall Aggression Scores

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	48.77	4	12.19	3.80	.005	.051	.890	.051	.037
Perception of local inequality	16.50	3	5.50	1.72	.164	.018	.446		
PRD	35.74	1	35.74	11.14	.001	.038	.914		
Error	910.88	284	3.21						
Model 2									
Corrected Model	72.54	7	10.36	3.28	.002	.076	.956	.076	.053
Perception of local inequality	17.77	3	5.93	1.88	.134	.020	.484		
PRD	30.30	1	30.30	9.60	.002	.033	.870		
Perception of local inequality * PRD	23.77	3	7.92	2.51	.059	.026	.618		
Error	887.12	281	3.16						

Post-hoc regression analyses indicated this interaction was due to a lack of predictive effect of PRD for those who chose diagram A (a small elite at the top, very few people in the middle, and the great mass of people at the bottom) on overall aggression scores, $F(1, 65) = 0.22$, $p = .641$, and diagram B (a pyramid with a small elite at the top, more people in the middle, and most people at the bottom), $F(1, 69) = 3.17$, $p = .079$. However, PRD was a significant predictor of overall aggression for people who chose diagrams C (a pyramid except that just a few people are at the bottom), $F(1, 43) = 4.34$, $p = .043$, and D (a society with most people in the middle), $F(1, 104) = 12.39$, $p = .001$, so that in both groups, higher feelings of deprivation were associated with higher interpersonal aggression scores. Full results of the post-hoc regressions can be seen in Table 4.25. However, when adjusting the alpha level for multiple comparisons (Bonferroni, requiring an alpha level of 0.0125 to reach significance), the only significant post-hoc regression appears to be for participants who chose category D (the category showing the highest level of equality).

Table 4.25

Post-Hoc Regression Results PRD as a Predictor of Overall Aggression Scores for Each Group of Participants Who Chose Diagrams A-D as Most Representative of Their Local Socioeconomic Distribution

	β	Standardised β	F	p	R^2	Adjusted R^2
Diagram A	-.023	.048	0.22	.641	.003	-.012
Diagram B	.072	.210	3.17	.079	.044	.030
Diagram C	.121	.303	4.34	.043	.092	.071
Diagram D	.123	.326	12.39	.001	.106	.098

4.3.6.4. *Direct Aggression*

When looking at perceived local inequality as the independent factor, PRD scores as a covariate, direct aggression scores only as the dependent, and the inclusion of an interaction term, PRD was marginally significant, $F(1, 281) = 3.79$, $p = .053$, $\eta p^2 = .013$. Full ANCOVA results can be seen in Table 4.26.

Table 4.26

ANCOVAs with and without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the Local Socioeconomic Distribution as Predictors for Direct Aggression Scores

	Type III Sum of Squares	*df*	Mean Square	*F*	*p*	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	27.41	4	6.85	1.76	.137	.024	.535	.024	.010
Perception of local inequality	13.20	3	4.40	1.13	.337	.012	.304		
PRD	14.967	1	14.97	3.85	.051	.013	.498		
Error	1104.68	284	3.89						
Model 2									
Corrected Model	45.06	7	6.44	1.66	.118	.040	.681	.040	.016
Perception of local inequality	12.97	3	4.32	1.12	.342	.012	.300		
PRD	14.66	1	14.66	3.79	.053	.013	.492		
Perception of local inequality * PRD	17.65	3	5.88	1.52	.209	.016	.400		
Error	1087.03	281	3.87						

4.3.6.5. Indirect Aggression

When looking at perceived local inequality as the independent factor, PRD scores as a covariate, indirect aggression scores only as the dependent, and the inclusion of an interaction term, PRD, $F(1, 281) = 11.81$, $p = .001$, $\eta p^2 = .040$, and the interaction term, $F(3, 281) = 2.72$, $p = .045$, $\eta p^2 = .028$, was significant. Full ANCOVA results can be seen in Table 4.27. Considering the violation of homogeneity of regression slopes (as indicated by the significant interaction), these results should be interpreted with caution. Nonetheless, PRD appears to be a highly significant predictor of indirect aggression.

Table 4.27

ANCOVAs with and without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the Local Socioeconomic Distribution as Predictors for Indirect Aggression Scores

	Type III Sum of Squares	*df*	Mean Square	*F*	*p*	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	56.83	4	14.21	4.38	.002	.058	.933	.058	.045
Perception of local inequality	18.25	3	6.08	1.88	.134	.019	.484		
PRD	43.26	1	43.26	13.34	<.001	.045	.954		
Error	920.76	284	3.24						
Model 2									
Corrected Model	82.83	7	11.83	3.72	.001	.085	.976	.085	.062
Perception of local inequality	19.86	3	6.62	2.08	.103	.022	.529		
PRD	37.61	1	37.61	11.81	.001	.040	.929		
Perception of local inequality * PRD	26.01	3	8.67	2.72	.045	.028	.657		
Error	894.76	281	3.18						

As reflected in the overall aggression scores, post-hoc regression analyses indicated this interaction was due to a lack of predictive effect of PRD for those who chose diagram A (a small elite at the top, very few people in the middle, and the great mass of people at the bottom) on overall aggression scores, $F(1, 65) = 0.16$, $p = .692$, and diagram B (a pyramid with a small elite at the top, more people in the middle, and most people at the bottom), $F(1, 69) = 3.65$, $p = .060$. However, PRD was a significant predictor of overall aggression for people who chose diagrams C (a pyramid except that just a few people are at the bottom), $F(1, 43) = 5.52$, $p = .023$, and D (a society with most people in the middle), $F(1, 104) = 13.59$, $p < .001$, so that in both groups, higher feelings of deprivation were associated with higher interpersonal indirect aggression scores. Full results of the post-hoc regressions can be seen in Table 4.28. However, when adjusting the alpha level for multiple comparisons (Bonferroni, requiring an alpha level of 0.0125 to reach significance), the only significant post-hoc regression appears to be for participants who chose category D (the category showing the highest level of equality).

Table 4.28

Post-Hoc Regression Results PRD as a Predictor of Indirect Aggression Scores for Each Group of Participants Who Chose Diagrams A-D as Most Representative of Their Local Socioeconomic Distribution

		Standardised β	F	p	R^2	Adjusted R^2
Diagram A	-.019	-.049	0.16	.692	.002	-.013
Diagram B	.077	.224	3.65	.060	.050	.036
Diagram C	.137	.337	5.52	.023	.114	.093
Diagram D	.132	.340	13.59	<.001	.116	.107

4.3.6.6. *Between Group Competition Risk-Taking*

When looking at perceived local inequality as the independent factor, PRD scores as a covariate, and risk scores in the between group competition domain as the dependent, no significant effects were found in models, either including, $F(7, 281) = 0.74$, $p = .635$, $\eta p^2 = .018$, or excluding the interaction term $F(4, 284) = 1.10$, $p = .385$, $\eta p^2 = .015$. Full ANCOVA results can be found in Table 4.29.

Table 4.29

ANCOVAs with and without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the Local Socioeconomic Distribution as Predictors for Risk-Taking Scores in the Between Group Competition Domain

	Type III Sum of Squares	*df*	Mean Square	*F*	*p*	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	6.45	4	1.61	1.10	.358	.015	.344	.015	.001
Perception of local inequality	3.30	3	1.10	0.75	.524	.008	.21		
PRD	3.98	1	3.98	2.70	.101	.009	.374		
Error	417.55	284	1.47						
Model 2									
Corrected Model	7.71	7	1.10	0.74	.635	.018	.319	.018	-.006
Perception of local inequality	0.86	3	0.29	0.19	.901	.002	.086		
PRD	2.53	1	2.53	1.71	.192	.006	.256		
Perception of local inequality * PRD	1.26	3	0.42	0.28	.838	.003	.104		
Error	416.30	281	1.48						

4.3.6.7. Within Group Competition Risk-Taking

When looking at perceived local inequality as the independent factor, PRD scores as a covariate, and risk scores in the between group competition domain as the dependent, no significant effects were found in models, either including, $F(7, 281) = 0.82$, $p = .576$, $\eta p^2 = .020$, or excluding the interaction term $F(4, 284) = 1.22$, $p = .301$, $\eta p^2 = .017$. Full ANCOVA results can be found in Table 4.30.

Table 4.30

ANCOVAs with and without an Interaction Term for Personal Relative Deprivation and Perceived Shape of Participant's Local Socioeconomic Distribution as Predictors for Risk-Taking Scores in the Within Group Competition Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	7.87	4	1.97	1.22	.301	.017	.382	.017	.003
Perception of local inequality	7.73	3	2.57	1.60	.189	.017	.419		
PRD	0.01	1	0.01	0.003	.953	<.001	.050		
Error	456.82	284	1.61						
Model 2									
Corrected Model	9.24	7	1.32	0.82	.576	.020	.350	.020	-.005
Perception of local inequality	0.78	3	0.26	0.16	.924	.002	.079		
PRD	0.03	1	0.03	0.02	.886	<.001	.052		
Perception of local inequality * PRD	1.38	3	0.46	0.28	.838	.003	.104		
Error	455.45	281	1.62						

4.3.6.8. *Status/Power Risk-Taking*

When looking at perceived local inequality as the independent factor, PRD scores as a covariate, risk-taking scores in the status/power domain as the dependent, and the inclusion of an interaction term, only PRD was a significant predictor, $F(1, 281) = 12.185$, $p = .001$, $\eta p^2 = .042$. Full ANCOVA results can be seen in Table 4.31.

Table 4.31

ANCOVAs with and without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the Local Socioeconomic Distribution as Predictors for Risk-Taking Scores in the Status/Power Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	14.50	4	3.63	5.02	.001	.066	.962	.066	.053
Perception of local inequality	2.09	3	0.70	0.96	.411	.010	.262		
PRD	13.28	1	13.28	18.37	<.001	.061	.990		
Error	205.23	284	0.72						
Model 2									
Corrected Model	16.11	7	2.30	3.18	.003	.073	.948	.073	.050
Perception of local inequality	0.67	3	0.22	0.31	.819	.003	.110		
PRD	8.83	1	8.83	12.19	.001	.042	.936		
Perception of local inequality * PRD	1.61	3	0.54	0.74	.528	.008	.208		
Error	203.61	281	0.73						

ANCOVAs reports for local neighbourhood diagram choices as a predictive factor, and PRD as a covariate, for risk-taking scores in the environmental exploration, food selection, food acquisition, parent offspring conflict, kinship, mate attraction, and mate selection risk domains can be seen in *Appendix Q.*

4.4. Discussion

The primary aim of the current study was to investigate whether individual differences in perceptions of personal relative deprivation (PRD) were better at predicting scores on various psychological risk-factors for violence than perceptions of inequality at a national or local level. Whilst some analyses did indicate that different perceptions of inequality in the UK may be associated with differences in impulsivity, and risk-taking in the between group competition domain, the status/power domain, and the mate selection domain; associations between risk factors for violence and PRD were considerably more robust.

When controlling for "perceptions of inequality in the UK" (from here-in referred to as UK PoI), PRD scores were found to be significantly negatively associated with consideration of future consequences (CFC) scores, and positively associated with impulsivity scores on the Eysenck Impulsivity Scale (EIS); risk-taking in the status/power domain; the food selection domain; mate attraction domain and the mate selection domain; as well as direct and indirect aggression. There was some evidence of an association with risk-taking in the between-group competition domain, but the results were less robust; only showing when an interaction with perceptions of inequality in the UK was taken into account.

4.4.1. The Relationship Between Perceptions of Inequality, Feelings of Personal Relative Deprivation, and Impulsivity

The bivariate association between PRD and EIS scores was weak but statistically significant. PRD was found to be associated with EIS in models that also included UK-PoI. UK-PoI however, only showed as a significant factor for impulsivity scores when no interaction term was included in the model; no longer reaching the threshold for significance when the interaction term between PRD and UK-PoI was included, despite the lack of significance of the interaction (*Table 4.12*). Impulsivity also showed weak associations with perceived current personal social position (*Figure 4.4, Panel C*) and the social position of their family during childhood (*Figure 4.4, Panel D*). The significance of these social position measures, in conjunction with the significance of PRD, but not the overall perceptions of UK PoI, suggests that the element of social comparison inherent to these measures may be important. However, the relative weakness of the associations

between the social position questions and EIS, compared to the association between PRD and EIS, suggests that the subjective experience of inequality may also be an important factor in the development of impulsivity.

PRD's association with impulsivity is consistent with previous research showing associations between impulsivity and violent crime (e.g. Gordon & Egan, 2011); specifically within the context of the association between income inequality and violent crime (e.g. Study 1; Daly et al, 2001; Elgar & Aitken, 2011; Gartner, 1990; Krohn, 1976). It is possible that increased inequality increases either the number of people who feel deprived, or the intensity of residents' feelings of deprivation in an area. If it is the case that inequality increases PRD; that PRD is associated with impulsivity; and that impulsivity is associated with violent behaviour; this suggests that impulsivity could be a proximal cognitive mechanism in the inequality-violent crime association. However, whilst it is a logical deduction that higher levels of inequality lead to increased feelings of deprivation, this is not something that has been empirically confirmed.

Impulsivity's association with UK PoI was considerably less robust. There was some indication that for those who perceived that more people were at the bottom of the socioeconomic distribution (diagrams A and B), impulsivity scores tended to be higher, but this was only the case relative to diagram C, with no significant differences in impulsivity scores to diagram D (*Figure 22*). This trend was not seen in perceptions of local inequality. When controlling for PRD, UK PoI only appeared to be a significant factor in the absence of the interaction term between PRD and UK PoI. When this interaction term was included, neither UK PoI or the interaction term reached the threshold for significance (*Table 4.12*). These results therefore suggest that one's level of impulsivity is more strongly associated with the extent to which they feel deprived, than with the level of overall inequality that they perceive there to be in their environment.

These results appear to be generally inconsistent with proposals by Daly (2017, p. 101) that inequality may affect impulsivity across all levels of the social hierarchy, and that those at the top may have the resources to express this in more socially acceptable ways. It is possible that effects of social desirability could be hiding impulsive traits amongst those higher up in the social distribution, but it is not possible to determine whether this is the case within this study. There is no clear reason why one might expect more affluent

individuals to be more likely to be subject to social desirability bias, except for potential differences in the extent to which impulsivity is *seen* as socially undesirable. Previous authors have alluded to the existence of different cultural values amongst lower socioeconomic status groups; i.e. a 'working-class culture' (e.g. see work on the cultural mis-match of first generation university students by Hecht et al, 2021), but differences in the extent to which traits such as impulsivity is seen as socially undesirable, does not appear to have been empirically tested. It is also possible that Eysenck et al's (1985) impulsivity scale may itself suffer from social desirability bias. If more affluent individuals have the means to express any impulsive tendencies in ways that are deemed as less socially undesirable, these might not be adequately detected by a scale that is itself suffering from social desirability bias.

However, it should be noted that in models that included PRD and perceptions of local inequality, PRD was only significantly associated with impulsivity scores in the absence of an interaction term. When this was included, none of the variables reached the threshold of significance. In order to confirm that PRDs association with impulsivity in the other analyses reflects a genuine association, future research should look to replicate it.

4.4.2. The Relationship Between Perceptions of Inequality, Feelings of Personal Relative Deprivation, and Consideration of Future Consequences

PRD was found to be significantly negatively associated with CFC. Significance was maintained in models that included both CFC and UK- or Local- PoI, which themselves did not show any significant associations. PRD's association with CFC in the current study indicated that the null results in Study 2 were likely due to the inappropriateness of the measures of perceived inequality and personal social position rather than a lack of relevance of CFC in the inequality-violence relationship. These results are consistent with the prediction that experiencing feelings of deprivation as a result of inequality leads to a focus on the present rather than future outcomes.

This is consistent with work by Daly and Wilson (2005) who have argued that future discounting, or a lack of consideration of the future in general, is implicit in much of the violent social competition that is seen in areas with higher socioeconomic inequality. Results do not indicate that the extent to which one considers the future is in any way related to their perceptions of the UK or local socioeconomic distribution. Significant bivariate

associations were found with some of the personal social position questions as used in Study 2 (*Table 4.9*), so that higher CFC scores were weakly associated with perceived higher personal social position; and to a lesser extent previous family social position. Ratings of poorer living conditions relative to others in one's local neighbourhood were also weakly associated with lower CFC scores. These associations, whilst weaker, also regard aspects of social comparison. Similarly to the results for impulsivity, the fact that these associations are weaker than those with PRD suggests that the subjective experience of these social comparisons may be an important factor for the development of this present time orientation.

4.4.3. The Relationship Between Perceptions of Inequality, Feelings of Personal Relative Deprivation, and Risk Taking

Another risk factor for violence that was included in the investigation was a proclivity for risk taking in certain key domains. An exploratory aim of the investigation was whether risk-taking would be increased across all domains (as shown in *Appendix K, and section 4.3.2.1*), or domains most relevant to intra-sexual competition, such as between- and within- group competition, and status domains. Bivariate associations (*Appendix J*) indicated that PRD was not associated with risk-taking in the between or within group competition domains, but was with risk-taking in the status/power, food selection, mate attraction, and mate retention domains. The relationship with risk-taking in the status domain is consistent with tentative predictions, but the lack of relationship with risk-taking in the between and within group competition domains is not. However, in an ANCOVA which included PRD as a covariate and UK PoI as an independent factor, a significant interaction with risk-taking in the between-group competition domain was found. Post-hoc analyses (*Table 4.18*) indicated that there was a positive association between feelings of deprivation and risk-taking in the between-group competition domain, only for those who chose diagram B. Whilst this again is one of the two diagrams which had a larger proportion of people at the bottom of the distribution, the lone result makes it difficult to interpret. This should be interpreted even more cautiously considering that no association was found between PRD and risk-taking in the between-group competition domain in the bivariate analysis; the ANCOVA with UK PoI that excluded the interaction term; or with the ANCOVA with perceived local inequality.

Furthermore, when applying a Bonferroni correction for multiple comparisons, this post-hoc analysis no longer reached significance.

The additional bivariate relationships between PRD and risk-taking in some, but not all domains, is not indicative of a general preference for all kinds of risks. The fact that the status domain was one of the risk-domains that was found to be associated with PRD, is particularly relevant to the current study. It is consistent with the concept central to this thesis, that increased inequality increases competition for status amongst men. In times of higher inequality, status is expected to have had a bigger impact of one's access to mates during human evolution. One's drive for status is feasibly an important factor for the violence that is seen in areas of higher inequality (see Daly, 2017). The extent to which one considers status or reputation to be important was not investigated within the current thesis, and would be a valuable avenue for future research. This would further corroborate the evolutionary theory that underpins the current thesis, as-well as improving understanding of the cognitive changes that take place as a result of inequality that can increases one's likelihood of violent behaviour. It was for these reasons that Study 4 focussed on the extent to which one values masculine status, and how this is associated with feelings of deprivation.

Increased risk-taking in the mate attraction and mate selection domains for those with higher PRD scores may be reflective of a present-time orientation, and shorter term-mating strategies, which would be consistent with Life History Theory (LHT). As explained in the introduction to Chapter 3 (Study 2), LHT within the field of evolutionary psychology, theorises that people will generally use 'faster' life strategies in unstable environments. Faster life-strategies are those that are 'high risk, high reward'. In regard to mating, this refers to trade-off's such as that between current and future reproduction; and the quality and quantity of offspring (see Nettle and Frankenhuis, 2020, for an overview of LHT in evolutionary psychology versus biology). Risk-taking within the context of mate selection and mate attraction is not the focus of the current thesis, but their apparent relationship with PRD, in the absence of risk-taking in some of the other evolutionary domains is informative nonetheless. It is suggestive that any associations between PRD and increased risk-taking may be confined to domains where this kind of behaviour would have once been adaptive.

Another possible explanation for the lack of PRD's association with risk-taking across all evolutionary domains is that it may reflect the fact that what *counts* as risky behaviour is context dependent. What one can *afford*, whether that be in terms of fitness, time, energy, or resources, can significantly alter how 'risky' a particular behaviour is. For example, choosing to exclusively eat organic, free-range food is a big risk for someone who has very little in terms of economic resources; but the opposite could be said for someone with sufficient resources.

4.4.4. The Relationship Between Perceptions of Inequality, Feelings of Personal Relative Deprivation, and Interpersonal Aggression

When taking into account Local PoI, results showed that higher feelings of deprivation were only associated with overall and indirect aggression scores for those who perceived their local socioeconomic distribution to be relatively equal, with less people at the bottom of the distribution, as in diagrams C and D. Furthermore, after Bonferroni correction was applied to the alpha level, only category D was shown to be significant. This is counter to prior predictions that perceptions of higher inequality would be associated with higher levels of aggression, as diagrams C and D represent socioeconomic distributions with lower Gini coefficients (indicating more equality) than diagrams A and B (see Bussalo et al, 2019). However, it may be that perceiving less inequality in the rest of one's local area *enhances* feelings of personal relative deprivation. For example, if everyone else is perceived as being on relatively equal footing, but one feels deprived anyway, it is a logical outcome that these individuals would feel as though they have even more of a competitive disadvantage than those who feel that the majority of others in their local area are also relatively deprived. This appears to be inconsistent with epidemiological associations found between higher levels of inequality, and violent crime (e.g. Study 1; Daly et al, 2001). It may be that when there are higher levels of socioeconomic inequality, the larger socioeconomic gap may increase the salience, and cognitive weight given to social comparisons with affluent individuals or groups, by lower SES people. This increased cognitive weight could cause them to overestimate the proportion of the population who are more affluent, even if that isn't actually the case. There is some evidence to suggest that increased salience of certain groups may lead to an overestimation of their frequency within a population (e.g. Wolfram, 2017). Moreover, if this is the case, it merely corroborates the importance of

one's subjective experience of socioeconomic inequality in the development of cognitive risk-factors for violence. It is however important to note that these aggression score differences were not seen between-groups in UK PoI diagram choices. This may reflect that local factors are more important in the development of aggression, but moreover, it should be noted that the association only exists for indirect aggression, and not direct aggression. Violence is arguably a directly aggressive act. The above discussion of differences in indirect aggression for those who perceive different local socioeconomic distributions is speculative. It is not clear whether the lack of consistency of results between local and UK perceptions of inequality, and direct and indirect aggression, is due to nuanced differences in the cognitive mechanisms involved, or whether the results are spurious. This is something that can only be determined by replication in future research.

4.4.5. Unexpected Associations Between Risk-Factors for Violence and Measures of Personal Social Position

Some unexpected positive associations were found between various single item measures of social position and risk-taking scores across multiple domains (Section 4.3.2.4). For example, risk-taking scores in the within group competition domain was positively associated with ratings of personal income (*Figure 4.5, Panel A*) and living conditions (*Figure 4.5, Panel B*) relative to others in the UK. Risk-taking scores in the between group competition domain was positively associated with ratings of personal income relative to others in their local area (*Figure 4.5, Panel C*). There was also an unexpected positive association between perceptions of current personal social position and aggression (*Figure 4.4, Panel E*), including both subscales; as well as between perceptions of previous family social position and direct aggression (*Figure 4.4, Panel F*). This contrasts the significant associations found between PRD and other risk-factors for violence, which all ran in the predicted direction. As previously noted, PRD was not associated with risk-taking in the within or between group competition domains, but was associated with risk taking in the status and power domain. It is difficult to draw any strong conclusions from these results, except that the subjective experience of PRD may potentially be particularly important in the development of risk-factors for violence. Further research would need to determine whether these unexplained associations could be replicated.

4.4.6. Further Consideration for Perpetrators' Consideration of the Future

Whilst CFC and impulsivity was found to be significantly associated with perceptions of relative deprivation, it is worth considering that not all violence in the name of status competition is necessarily the result of a lack of focus on the future. For those living in communities that strongly adhere to masculine honour ideology, placing extremely high value on reputation and formidability, retaliatory acts of violence may be entirely tactical; resulting from social pressure, and genuine fear of the future consequences on their social status, or even their mortality. It should not be assumed that in all cases of violent behaviour, perpetrators are underestimating, or failing to consider the possibility of criminal sanctions. It is possible; indeed, it is likely, that some individuals judge the consequences of not engaging in violent behaviour as being more severe in nature than the possibility of criminal sanctions. So whilst cognitive factors related to present time orientation (such as lower CFC and higher impulsivity) appear to contribute to the relationship between inequality and violent behaviour, it is likely that for some individuals, the decision to engage in violent behaviour is a much more conscious and considered form of status competition. This is particularly worth considering due to the existence of masculine honour ideology (which involves the conscious endorsement of the use of violence to defend one's honour), and the relationship found with feelings of deprivation in Study 4. Furthermore, it has been shown that gang members cite threats to status as motivation for acts of violence against other gangs, and these back-and-forth retaliations can span long periods of time (e.g. see Vandenbogaerde & Hellemont, 2016); albeit, inter-group competition dynamics do come into play here.

4.4.7. Limitations

It is important to note that there are several limitations with the current study. Effect sizes were not large for the majority of associations found in current study; there was a wide variety of variables being investigated; and multiple comparisons, which increases the chance of Type I errors. To ensure that these relationships between PRD and risk-factors for violence are genuine, future research should look to replicate these findings, ideally with a pre-registered analysis plan

A common limitation of survey studies is that they are subject to social desirability biases, which can often hide relationships that exist within the sample. However, in the

current study, the predicted relationships were found despite this risk of social desirability effects. If any social desirability effects were present in the data, this would likely indicate that the 'real' relationships were in fact stronger than what was indicated by the data.

Whilst it is informative to find an association between feelings of deprivation and risk-factors for violence, it is not clear what cues or experiences cause these feelings of deprivation, and whether there are any protective factors. As mentioned above, there is no epidemiological research demonstrating that experiences of higher levels of inequality in society lead to increased feelings of deprivation, despite it being a logical deduction. Moreover, although risk factors for violence were investigated, violence itself was not measured within the current study. So whilst these results are indicative that PRD, impulsivity, CFC, and proclivity for status related risks, are some of the proximal mechanisms involved in the inequality-violence relationship seen in previous empirical work (e.g. Study 1; Daly et al, 2001), this should be interpreted with caution. More research should be carried out in order to fill these conceptual and empirical gaps.

Another limitation in the current research is the self-selection bias that comes with participant recruitment platforms such as Prolific Academic. It is unlikely that there was a sufficiently representative sample of the population. For example, it is unlikely that those who are very deprived, or very affluent, would be subscribed to a participant recruitment platform. Comparing the cognitive traits of individuals at these extremes of the distribution could be informative, as these are arguably the parts of the socioeconomic distribution that have the most intense levels of competition. To illustrate with an over-simplified example, in a society of 100 people, if every individual was ranked in terms of their status, the impact of being ranked 48th versus 49th potentially has relatively little impact on one's fitness. The difference however between being ranked 1st and 2nd however is likely to be considerably less negligible in terms of access to mates. At the bottom of the distribution, as argued previously throughout this thesis, an increase in status, however little, can mean the difference between having any access to mates at all. Daly's (2017, p.101) prediction that more affluent individuals may still be affected by high levels of inequality, but able to express it in more socially acceptable and safer ways, may still stand if one was to compare these extreme ends of the distributions.

Overall, the results from the current study showed that feelings of personal relative deprivation are significantly associated with several cognitive risk-factors for violence, including increased impulsivity, decreased consideration for the future, increased risk-taking in the status/power domain, and interpersonal aggression. This subjective experience of inequality appeared to be more important than overall perceptions of the socioeconomic distribution at the local or national level. Increased risk-taking was found in some, but not all evolutionary domains (as PRD scores increased), indicating that PRD may be associated with domain specific risk-taking. In regards to risk-taking in domains most related to intra-sexual competition; status related risks, rather than within-, or between-group competition related risks, were shown to be positively associated with PRD. These results are the beginning of an improved understanding of the proximal mechanisms that lead socioeconomic inequality to be associated with higher levels of violent crime (see e.g. Study 1; Daly et al, 2001). With multiple potential directions for future research, follow-up studies can look to replicate and refine what was found. One factor not investigated in the current study was the extent of the influence of culture in one's willingness to use violence; something that has been discussed in previous work on cultures of honour (e.g. Nisbett & Cohen, 1996). People who live in areas known to have a Culture of Honour tend to subscribe to beliefs surrounding masculine honour; which heavily values status, and endorses the use of violence in order to protect one's status and property. Considering the relationship between PRD and status-related risk-taking; the following study investigates whether masculine honour values are also associated with PRD. Consideration is given to what this might mean for the formation and maintenance of cultures of honour. The following study examines the extent to which one values status, in the form of masculine honour values, and whether or not this is associated with feelings of deprivation.

4.4.8. Reflections

Upon reflection, it would have been possible to take a different approach to the analysis in this study; using Griskevicius et al's (2009) measure of aggression in hypothetical social situations as a proxy measure for violence. This could have allowed for the use of a mediation analysis; developing a model with perceptions of inequality or feelings of deprivation as predictors of aggression, with cognitive risk-factors for violence (in the form of impulsivity, CFC, and risk-taking behaviour), as potential mediating variables for participants' aggression scores. As tempting as this was, it was decided that Griskevicius et al's (2009) aggression measure was best conceptualised as a risk-factor for violence, rather than a proxy measure for violence. Whilst some of the responses in this aggression measure do involve violence, it's aim is to measure aggression more generally, rather than only violent forms of aggression (e.g. including verbal or social aggression, such as spreading rumours about someone). Furthermore, the measure only concerns hypothetical responses to hypothetical social interactions, rather than measuring actual violent incidents.

Study 2 used an ANOVA, to investigate whether participants' perceptions of inequality (as a categorical variable in the form of diagram choice) predicted their scores on risk-factors for violence. In order to maintain consistency with the prior study, it was decided that the analyses in Study 3 would be carried out in a similar manner, except with the additional consideration of feelings of personal relative deprivation (PRD). Given that perceived inequality was a categorical predictor in Study 2's ANOVAs, the need to include PRD as an additional continuous predictor led to the choice of an ANCOVA analyses. ANCOVA analyses require the data to meet two additional assumptions to ANOVAs; independence of covariate and treatment effects; and homogeneity of regression slopes across groups. Analyses did show that there was a significant main effect of participants' diagram choice for the UK socioeconomic distribution on participants PRD scores, however the effect size was small (partial eta squared of 0.05), and pairwise comparisons revealed the only significant difference was between groups A and D. In the case of participants diagram choice for their neighbourhood socioeconomic distribution, there was no main effect on PRD scores. It was therefore decided that the minor violation of this assumption for one predictor was

sufficiently small that the ANCOVA approach could be retained. Regarding the homogeneity of regression slopes, there were, in some cases, (generally small) significant interactions between PRD and participant's diagram choice, indicating that this assumption may have been violated. It could be argued that at least in the case of some studies, interactions in ANCOVAs can themselves be informative. An interaction indicating that feelings of deprivation are only associated with a particular risk-factor for violence in those who also perceive high levels (or indeed low levels) of inequality, could itself be meaningful, showing merely that both factors need to be present. The potential meanings of the significant interactions in these analyses are discussed above. However, as this is considered to be an important assumption for ANCOVAs, at least in the case of variables which showed a significant interaction (e.g. indirect aggression scores for UK inequality analyses), it means that the results should be interpreted with caution. What is perhaps re-assuring, is that PRD consistently showed highly significant associations with a range of psychological risk-factors for violence. Should these associations have only been borderline significant, then these violations would have perhaps been more concerning.

However, after having carried out this study, it was further reflected that a single MANCOVA would have been a more appropriate analysis than the multiple ANCOVAs that were used, in order to reduce the chance of Type 1 error. In future analyses, a MANCOVA should be used.

5. Chapter 5:   Study 4 - Perceptions of Personal Relative Deprivation and Beliefs About Masculine Honour

5.1. Introduction

The current thesis builds on previous epidemiological research that has demonstrated an association between economic inequality and violent crime (e.g. Daly et al, 2001; Gartner, 1990; Krohn, 1976; Elgar & Aitken, 2011). One evolutionary psychological perspective on this association, involves the theorised increase in male intrasexual competition that occurs when there is more inequality (Daly, 2017). As humans are an effectively polygynous species, status is theorised to have had a bigger impact on access to mates for males in ancestral environments, relative to females. As resource distribution inequality increases, status is theorised to have become increasingly important in regard to males' mating opportunities in ancestral environments. It is theorised that these pressures meant that males evolved to respond to increases in socioeconomic inequality by becoming increasingly competitive and status driven; showing a higher tendency to use risky and violent tactics to protect, or increase their status. Put simply, males who were more willing to take risks to compete for their position in high-risk environments, would have been more likely to gain more access to mates, produce more offspring, and therefore pass any genetic predispositions for those behaviours onto future generations (for an in-depth review of this theory, see Daly, 2017).

There have however, been arguments that the high regional variation in violent crime rates (e.g. as seen in the United States) is a result of persistent regional cultural differences rather than socioeconomic inequality. Nisbett and Cohen (1996) for example, believe that the southern states in the US have a reputation for violence due to what they call a 'Culture of Honour'. This difference between Northern and Southern men has been demonstrated in research by Nisbett and Cohen (1996; Cohen et al, 1996), in a study of white, male University students. The study showed that when a confederate bumped into participants and verbally insulted them, southern students were rated by observers as showing significantly more anger than northern students. They were reported by another confederate as having a more 'dominant' handshakes after this bump-and-insult scenario, and were also found to take longer to take evasive action in order to avoid a second 'bump'

with a further male confederate. These behavioural differences were reflected in physiological measures; which showed that southern students presented with higher increases in cortisol and testosterone levels after being bumped and insulted, relative to northerners, who showed very little change.

Higher adherence to masculine honour ideology in Southern US States has also been demonstrated using questionnaire measures (Saucier et al, 2018). Nisbett and Cohen (1996) theorise that the reason people in the South are more violent, is because of the history of the people that settled there. They explain that majority of the settlers that emigrated to the Southern states, were primarily from areas of Britain that were unsuitable for intensive farming (e.g. Scotland and Ireland), and so they relied mostly on herding. This style of living meant that there were limited resources, and as a result, theft of livestock was common. The ability and willingness to use violence would have been valuable for both taking livestock from others, and defending their own. Nisbett and Cohen (1996) explain that this was especially important because the low population density and general geography of the areas where herders lived, made it difficult for law enforcement officials to reach, and provide defence against these robberies. They proposed that herdsmen were required to be sensitive to anything that could harm their reputation, as they needed to be extremely careful to address anything that could imply they might not be capable of defending their property. The sensitivity to insult shown by Southern men in Nisbett and Cohen's study (1996; Cohen, et al, 1996), was proposed to be because of the historical pressures faced by herdsmen in these Southern states, to be extremely careful to address anything that could imply that they might not be capable of defending their property. The importance of defending one's reputation meant that these cultural values would therefore have been passed on through the generations. They argue that this culture of honour in the Southern States is self-perpetuating, and does not need to be maintained by other factors (such as inequality).

It is, however, worth noting that the feedback loops that occur due to the effects that deprivation has on cognition and behaviour, means that one's economic circumstances can also be self-perpetuating; within individuals, and across generations (For a discussion of this, see Pepper and Nettle, 2017). Cultural values related to masculine honour may be passed on from previous generations, but this does not necessarily mean that one's

socioeconomic situation is irrelevant. The issue of whether this culture is self-perpetuating, or maintained by an economic factor such as economic inequality, is further complicated by the fact that the Southern states that have this culture of Honor, are also the states which appear to be higher in inequality (e.g. see Daly, 2017, p.140). Nisbett and Cohen (1996) criticise research indicating that regional variation in homicide rates can be explained primarily by demographic rather than cultural factors, on the basis that the supporting research relies on data that is too aggregated; that cities of all sizes should be analysed; and that they should be analysed separately (1996, p 14). However, this issue of aggregated data is addressed to some extent by the previous studies in this thesis. Study 1 showed that there is a relationship between economic inequality and violent crime at a fine geographical resolution; looking at variation in violent crime rates between London electoral Wards. Further to this, Study 3 looked at a potential subjective consequence of inequality at the individual level; a sense of personal relative deprivation (PRD), and showed this to be associated with cognitive risk-factors for violence. The fact that the same states that have a Culture of Honour, are also those that are higher in inequality, may be coincidental; but with both of these factors being linked to increased levels of violence, it is worth considering whether they are connected.

The period of herding described by Nisbett and Cohen (1996) as the origin of this culture of honour in the US South, appears to reflect an intensely competitive socioeconomic state, meaning that Nisbett and Cohen's (1996) theory may not necessarily be as incompatible with the theorised importance of inequality as it may first appear (Daly, 2017, Chapter 7). The theory that intense competition for resources in the form of livestock would lead to an increased willingness to use violence to defend one's reputation, is not too dissimilar to the theory that socioeconomic inequality increases competition, and one's proclivity for violence in order to defend one's social status. The results from Study 3 showed that feelings of deprivation were associated with several potential cognitive risk-factors for violence, including increased aggression, impulsivity and risk-taking in some, but not all domains. The fact that one of these domains was that of status and power, only corroborates the importance of status and reputation to individuals in these contexts. The increased importance of one's status or reputation in these competitive situations, is a

common thread within these two theories of the origin of geographical variation in people's willingness to use violence.

However, whilst the theorised origin of this culture of honour may appear to be consistent with the theorised influence of socioeconomic inequality, Nisbett and Cohen (1996) pose that this culture of honour is self-perpetuating, and does not need to be maintained by current socioeconomic inequality. However, Daly (2017, p 145) found that even when only looking at inequality and homicides amongst 'non-hispanic white men', which was the culture of interest in Nisbett and Cohen's (1996) work, higher economic inequality was still associated with increased homicide rates; with higher inequality, and higher homicide rates in the southern states, compared to the northern states. According to Daly, the data indicates that geography appears to have little influence on homicide rates once inequality is taken into account. In light of the higher inequality in Southern states, it is difficult to disentangle the effects of inequality and culture; i.e. it is unclear whether this culture of honour is self-perpetuating as indicated by Nisbett and Cohen (1996), or whether it is being maintained by the increased inequality in the US South. Additionally, this research is also subject to the concern posited by Nisbett and Cohen (1996) regarding the aggregation of data.

Given that it is possible that cultures of honour emerge, and are maintained in response to inequality; the existence of higher inequality in states known to adhere to beliefs surrounding masculine honour; and the associations that were found between PRD and risk-factors for violence in Study 3 (including a proclivity for status related risks); the current study aimed to investigate whether feelings of personal relative deprivation (PRD) are positively associated with the endorsement of beliefs relating to masculine honour. As individual level data, there would be no concerns regarding the issue of excessively aggregated data.

As indicated by Nisbett and Cohen's argument for the historical origin of the culture of honour in the South, it is clear how it could be adaptive for one to value these 'masculine honour' traits in times of more intense competition. Appearing formidable; defending one's property; and one's status, becomes hugely important in these circumstances. With PRD (as a subjective experience of inequality) being associated with risk-factors for violence as shown in Study 2; it is entirely possible that PRD also leads to a conscious endorsement of

the willingness to use violence in order to defend oneself; one's property; one's family; and one's status.

One way of measuring the extent to which one endorses values of masculine honour is the Masculine Honour Ideology (MHI) scale (Barnes, Brown & Osterman, 2012). Higher scores on this scale have previously been found to be associated with a higher proclivity for risk-taking (Barnes, Brown & Tamborski, 2012); and endorsement of hostile responses to terrorist attacks (Barnes, Brown & Osterman, 2012). More recent research using the similar Masculine Honor Beliefs Scale (Saucier & McManus, 2014; Saucier et al, 2016) has found masculine honour values to be associated with positive perceptions of men who choose to fight when confronted with threats to their masculinity, and negative perceptions of men who choose to walk away (O'Dea et al, 2017; O'Dea et al, 2018). It has been associated with greater sensitivity to slurs that challenge one's masculinity, and reported likelihood of responding aggressively to these slurs (Saucier et al, 2015). It has also been associated with greater concern, and drive for muscularity; and the belief that men who lift weights do so in order to appear formidable, and defend themselves against threats (Saucier et al, 2018). Moreover, the extent to which one adheres to these values was found to be detectable by observers in brief social interactions (Saucier et al, 2018).

Whilst the majority of these studies appear to show that adherence to these masculine honour beliefs and values are merely associated with characteristics that have substantial overlap with the original concept, they do suggest that the extent to which one adheres to these values is measurable. Moreover, research indicating that these values are associated with increased risk-taking behaviour is consistent with the increased proclivity for risk in some domains that was found to be associated with PRD in Study 3, and further suggests that PRD may have a relationship with masculine honour ideology.

Based on the literature reviewed above, it was predicted that PRD would be positively associated with increased endorsement of masculine honour ideology. Additionally, the current study aimed to replicate key findings from Study 3 of associations between feelings of personal relative deprivation and psychological risk factors for involvement in violence (increased impulsivity, aggression, and decreased consideration of future consequences).

Furthermore, results from Study 3 indicated that PRD had stronger relationships with the above risk-factors for violence than did perceptions of one's position in society; whether that be in the form of a direct assessment of one's social position; one's social position during development; or how one rates their income, and living conditions relative to others in their local neighbourhood, or relative to others in the UK as a whole. For consistency and comparison, these measures of perceived social position were again included in the current study as an alternative measure related to the subjective experience of inequality at the individual level.

5.2. Method

5.2.1. Participants

Participants were recruited via the participant recruitment platform Prolific Academic, to take part in a survey study investigating "Economic views, personal beliefs and values". Before exclusions, 195 participants aged 18-72 (M = 34.44, SD = 12.59) agreed to take part in the study. The majority of participants were white (89.2%, Table 5.1), and had a relatively high level of education, with 80% having achieved an A-Level qualification or higher, and 53.9% having achieved at least a degree level qualification. Only 1% of participants had no formal qualifications (a full report of participants' qualifications can be seen in Table 5.2). In regard to participants employment status (see Table 5.3), 51.8% were employed full time, 10.3% were employed part-time, and 38.0% were not working for various reasons. The proportion of participants that had annual incomes below £10,000 was 24.1%; and the majority of the sample (87.7%) had annual incomes below £40,000 (see Table 5.4 for a full report of participants' income brackets). For context, the Annual Survey for Hours and Earnings (ASHE, ONS, 2020) reported that median income in the UK for the year 2019 was £24,937 (M = £30, 673) for all employees, and £30,418 (M = £37,618) for male employees (ONS, 2020). The bottom decile of male employees in the UK earned below £12,766 in 2019. These figures provide *some* context; but are not directly comparable due to their exclusion of non-working individuals, which made up 38% of the sample.

Table 5.1

Participants Self-Reported Ethnic Group

Ethnic group	Frequency (n)	Percent (%)
White	174	89.2
Mixed / Multiple ethnic groups	2	1.0
Asian / Asian British	13	6.7
Black / African / Caribbean / Black British	4	2.1
Other ethnic group	2	1.0

Table 5.2

Highest Level of Education Completed by Participants

Education Level	Frequency (n)	Percentage (%)
Higher degree (e.g. PhD, MSc).	20	10.3
Degree level qualification (e.g. BSc, BA, or equivalent)	85	43.6
Higher educational qualification below degree level (e.g. PGCert, PGDip)	9	4.6
A-Levels or Highers	42	21.5
ONC / National Level BTEC	11	5.6
O-Level / GCSE / CSE	26	13.3
No formal qualifications	2	1.0

Table 5.3

Participant Employment Status

Employment Status	Frequency (n)	Percentage (%)
Employed full time	101	51.8
Employed part time	20	10.3
Unemployed and currently looking for work	15	7.7
Unemployed and not currently looking for work	6	3.1
Student	23	11.8
Retired	11	5.6
Homemaker	4	2.1
Self-employed	12	6.2
Unable to work	3	1.5

Table 5.4

Self-Reported Personal Annual Income Before Tax and Other Deductions

Personal Income	Frequency (n)	Percentage (%)
Less than £10,000	47	24.1
£10,000 - £19,999	41	21.0
£20,000 - £29,999	44	22.6
£30,000 - £39,999	39	20.0
£40,000 - £49,999	12	6.2
£50,000 - £59,999	9	4.6
£80,000 - £89,999	1	0.5
£90,000 - £99,999	1	0.5
More than £150,000	1	0.5

5.2.2. Measures

5.2.2.1. *Measures Relating to Subjective Experiences of Inequality*

5.2.2.1.1. Personal Relative Deprivation

The Personal Relative Deprivation-*revised* (PRD-r) Scale (Callan et al, 2008; Callan et al, 2011) was used to measure participants' subjective experience of inequality. The scale consists of 5 items which assess the extent to which participants feel deprived relative to others 'like them', and has been shown to have good internal reliability (α = .78, Callan et al, 2011; α = .83, Callan et al, 2015; α = .87, Kim et al, 2017). Participants were asked to indicate the degree to which they agree with five statements on a 6-point Likert scale, ranging from strongly disagree to strongly agree (see *Appendix F* for statements). Two of the items were reverse scored, and the sum of the scores was calculated in order to attain a perceived personal relative deprivation score for each participant.

5.2.2.1.2. Personal Social Position

For consistency with Studies 2 and 3, the 6 questions regarding participants' beliefs about their social position relative to others was assessed using questions based on the 2009 ISSP (2017, Q10a, Q10b), and the Afrobarometer (2005, Q2b; as used by Rustad, 2016). The answers for each item acted as stand-alone measures of various aspects of perceived social position. These were intended for use in further exploratory analyses, separate to the main hypotheses.

In order to explore the importance of present versus previous familial position, participants' beliefs about their social position relative to others was assessed using two questions from the ISSP (2017, Q10a, Q10b), answered using a 10-point ordinal scale, and worded as follows:

"In our society there are groups which tend to be towards the top and groups which tend to be towards the bottom. Below is a scale that runs from top to bottom. Where would you put yourself now on this scale? (Please tick one box)" (ISSP, 2017, Q10a);

"And if you think about the family that you grew up in, where did they fit in then? (Please tick one box)" (ISSP, 2017, Q10b).

Lower answers closer to "1" represented lower social positions; whereas higher answers closer to "10" represented higher social positions.

The following questions were used in Studies 2 and 3 in order to explore the importance of socioeconomic position at both a local and national level; as well as which factors individuals may use as indicators of relative social position. The questions were based on a question from the Afrobarometer (2005, Q2b), used by Rustad (2016) to measure perceived inequality in Nigeria; originally worded as "In general, how do you rate your living conditions compared to those of other Nigerians?". As in Studies 2 and 3, this question was adapted to create 4 questions for the current study, and were worded as follows:

"In general, how do you rate your income compared to those of other people in the UK?"

"In general, how do you rate your living conditions compared to those of other people in the UK?"

"In general, how do you rate your income compared to those of other people in your local area/neighbourhood?"

"In general, how do you rate your living conditions compared to those of other people in local area/neighbourhood?"

As in the Afrobarometer (2005, Q2b; see Rustad, 2016), answers for these questions were given in the form of a Likert scale ranging from 1("Much worse off"), to 5 ("Much better off").

5.2.2.2. Masculine Honour Ideology

In order to measure the extent to which participants endorsed beliefs regarding masculine honour, participants completed the Masculine Honor Ideology (MHI) scale (Barnes, Brown & Osterman, 2012); a 16-item scale which has been shown to have high internal consistency, (α = .94; Barnes, Brown, & Osterman, 2012). Each item consists of a

statement reflecting a belief about masculine honour (see *Appendix R* for statements), for which participants must answer in the form of a Likert scale ranging from 1 (strongly disagree) to 9 (strongly agree).

5.2.2.3. Risk Factors for Violence

The cognitive risk factors for violence used in Study 3; self-reported interpersonal aggression, impulsivity, and CFC; were included in the current Study for consistency and further exploratory analyses, separate to the main hypothesis.

5.2.2.3.1. Aggression

As in Studies 2 and 3, a self-report measure from Griskevicius et al (2009) was used in order to measure the participants' likelihood of aggression in social situations. The scale includes 2 subscales; direct, and indirect aggression, which have both been shown to have good internal consistency (α = .78 - .80; Griskevicius et al, 2009). Questions are preceded by a description of a social situation which participants are asked to imagine themselves in, where they are at a party and somebody from their class spills a drink on them and does not apologise. They are then asked how much they would want to engage in a list of 8 behaviours (4 involving "Direct Aggression", and 4 involving "Indirect Aggression") on a scale from 1(not at all) to 9 (very much). The mean for the indirect aggression items was then calculated to attain an indirect aggression score; the same was done for the direct aggression items, and the overall aggression score. The vignette and question items can see seen in Appendix C.

5.2.2.3.2. Impulsivity

As in Study 3, impulsivity was measured via Eysenck et al's (1985) 19-item Impulsivity Scale (EIS); a subscale from the Eysenck Impulsiveness, Venturesomeness, and Empathy Inventory, which has been shown to have good internal consistency (α = .82 - .85, Eysenck et al, 1985). Participants were required to answer "yes" or "no" to each item. For 16 of the items, an answer of "yes" equated to 1 point each, whilst the remaining 3 items were reverse coded, so that an answer of "no" for those items gave the participant 1 point each. For each participant their points were summed, giving them each an impulsivity score, where a higher score indicated higher trait impulsivity. The list of items can be seen in Appendix H.

5.2.2.3.3. CFC

As in Studies 2 and 3, the Consideration of Future Consequences (CFC) scale (Strathman et al, 1994) was included as a potential proximate cognitive factor. The CFC scale consists of 12 items which assess the extent to which an individual focuses on short-term or long-term consequences, and has been shown to have good internal consistency (α = .868, Strathman et al, 1994). Participants indicated how characteristic they believed each item to be of themselves via a Likert scale ranging from 1 (extremely uncharacteristic) to 6 (extremely characteristic), giving participants a score between 1 and 6 for each item. Of these 12 items, 7 were reverse scored (so that low agreement with the statement gave participants the full 6 points). The scores for each item were summed, giving each participant a CFC score, where a higher score indicates a higher consideration for future consequences, i.e. the extent to which an individual considers potential future consequences of their current behaviours. The list of items can be seen in Appendix D.

5.2.3. Preregistration and Analysis

The study was pre-registered on the As Predicted website (#25708). As stated in the pre-registration, multivariate GLM was used to test whether PRD predicted a) CFC, b) Impulsivity, c) HIM; d) indirect aggression; and e) direct aggression scale scores. Pearson's correlation coefficients were calculated to quantify the strength of bivariate associations between PRD and each of the dependent measures.

As specified in the pre-registration, participants who provided identical responses to all items on the PRD, CFC, or Eysenck et al's (1985) Impulsivity scale, had their scores on that scale excluded. Each of these scales includes reverse coded items – so identical responses to all items would mean inconsistency across items and likely reflect lack of attention. Where a variable was missing for a particular participant - pairwise deletion was used to exclude participants only from analyses involving that variable. The full pre-registration can be seen in *Appendix S.*

5.2.4. Procedure

Ethical approval for this study was granted by Brunel University London College of Health and Life Sciences Research Ethics Committee (Reference: 17259-LR-Jun/2019- 19370-1; *Appendix S*). Participants were recruited via the participant recruiting website Prolific Academic, to take part in an online study titled "Economic views, personal beliefs and values", and received £3 as compensation for their time. After providing informed consent online and given the opportunity to contact the investigators regarding any questions, participants completed the series of questionnaires hosted on Qualtrics. Questions asking participants' gender and age were followed by the social position questions from Studies 2 and 3, which had been based on the Afrobarometer and the 2009 ISSP. This was followed by the CFC, Impulsivity, Personal relative deprivation, aggression and Masculine Honour Ideology scale questionnaires, for which the order was randomised between participants. Once these scales had been completed, further demographic questions were asked regarding their ethnic group, education level, employment status, and personal income (before deductions). A debriefing form was provided at the end of the questionnaire.

5.3. Results

5.3.1. Descriptive Statistics

5.3.1.1. Participant Exclusions

As specified in the pre-registration on As Predicted (#25708), participants who provided the identical answers for all questions in the PRD, Impulsivity or CFC questionnaires were excluded from analyses as these scales included reverse coded items. This affected 6 participants who gave identical responses on all the PRD items, leaving a total of 189 participants with valid scores for this scale. Additionally, 1 participant's EIS score, and 2 participants MHI scores, were recoded as missing values on those respective scales due to incomplete responses; resulting in 194 participants with valid EIS scores, and 192 with valid MHI scores.

5.3.1.2. Scale Descriptive Statistics

Table 5.5

Descriptive Statistics for Scale and Ordinal Variables, Including Internal Consistency Measures (Cronbach's α) for Scale Variables

Scale	Participant Score M(SD)	Participant Score Range (Full Range)	Scale Reliabilities Cronbach's α (items n)
Personal Relative Deprivation (PRD)	3.11 (0.99)	1.00-5.60 (1.00-6.00)	.816 (5)
Consideration of Future Consequences (CFC)	39.26 (7.64)	20.00-57.00 (12.00-72.00)	.855 (12)
Eysenck Impulsivity Scale (EIS)	6.22 (4.59)	0.00-17.00 (0.00-19.00)	.853 (19)
Masculine Honour Ideology (MHI)	67.51 (28.20)	16.00-135.00 (16.00-144.00)	.951 (16)
Overall aggression	2.95 (1.60)	1.00-9.00 (1.00-9.00)	.912 (8)
Indirect aggression	3.13 (1.94)	1.00-9.00 (1.00-9.00)	.931 (4)
Direct aggression	2.76 (1.68)	1.00-9.00 (1.00-9.00)	.894 (4)
Perceived personal social position (ISSP)	5.26 (1.53)	1.00-9.00 (1.00-10.00)	- (1)
Perceived family social position (ISSP)	4.95 (1.61)	1.00-9.00 (1.00-10.00)	- (1)
Income relative to UK (AB)	2.78 (0.91)	1.00-5.00 (1.00-5.00)	- (1)
Living conditions relative to UK (AB)	3.25 (0.70)	2.00-5.00 (1.00-5.00)	- (1)
Income relative to neighbourhood (AB)	2.84 (0.84)	1.00-5.00 (1.00-5.00)	- (1)
Living conditions relative to neighbourhood (AB)	3.10 (0.66)	1.00-5.00 (1.00-5.00)	- (1)

Note. "ISSP" - International Social Survey Program (2017); "AB" – Afrobarometer (2005).

5.3.2. GLM

As specified in the pre-registration on As Predicted (#25708), a multivariate GLM was carried out to examine the relationship between Personal Relative Deprivation (PRD) scores and the dependent variables; Consideration of Future Consequences scores (CFC), Eysenck's Impulsiveness Scale (EIS) scores, indirect and direct aggression scores, and Masculine Honor Ideology (MHI) scores. It was found that the GLM was significant ($V = .142$, F (5, 179) = 5.92, $p < .001$). As was predicted, CFC (F (1,183) = 18.99, $p < .001$), direct aggression (F (1,183) = 10.45, $p = .001$), impulsivity (F (1,183) = 6.74, $p = .010$), and HIM scores (F(1,183) = 7.40, $p = .007$) were significantly predicted by PRD. Indirect aggression (F (1,183) = 2.88, $p = .091$) however, was not significantly predicted by PRD.

Table 5.6

Tests of Between-Subjects Effects for Masculine Honor Ideology (MHI), Direct Aggression, Indirect Aggression, Impulsivity (EIS), and Consideration of Future Consequences (CFC) Scores, as Predicted by Personal Relative Deprivation (PRD) Scale Scores

Dependent Variable	df	F-test value	Significance (p)	η_p^2
MHI	1, 183	7.40	.007	.039
Direct Aggression	1, 183	10.45	.001	.054
Indirect Aggression	1, 183	2.88	.091	.016
EIS	1, 183	6.74	.010	.036
CFC	1, 183	18.99	<.001	.094

Also as specified in the pre-registration; for completeness, inter-correlations between CFC, Impulsivity, MHI and aggressiveness scores will be examined on an exploratory basis. Relationships between demographic variables (age, employment status, educational level, self-reported income) and the dependent measures will be examined on an exploratory basis.

Alternative measures of perceived personal relative deprivation (adapted from the International Social Survey Programme and Afrobarometer) are included for exploratory purposes (to examine how they relate to PRD scale scores).

5.3.3. Bivariate Associations

Table 5.7 shows bivariate associations for all key variables, including MHI, PRD, CFC, EIS, the domains of the evolutionary risk scale, and interpersonal aggression. The bivariate analyses on these scale variables were tested using Pearson's correlations. A full report of all bivariate associations, including the individual items regarding perceived personal social position (based on the Afrobarometer and the ISSP), can be seen in *Appendix T*. Spearman's rho was used to analyse associations involving the ordinal measures of perceived personal social position due to each variable only consisting of 1 ordinal item.

As predicted, PRD was positively associated with masculine honour ideology, with those who reported feeling more deprived reporting higher endorsement of masculine honour ideology ($r(184) = .192$, $p = .009$; *Figure 5.1; Panel A*); though the association was relatively weak. PRD also showed the predicted positive associations with overall ($r(187) = .193$, $p = .008$; *Figure 5.1, Panel B*) and direct aggression ($r(187) = .228$, $p = .002$; *Figure 5.1, Panel C*), so that higher feelings of deprivation were associated with higher aggression scores. However, no association was found between PRD and the indirect aggression subscale ($r(187) = .120$, $p = .099$, *Figure 5.1, Panel D*). PRD also showed the predicted positive association with EIS ($r(186) = .202$, $p = .006$; *Figure 5.1, Panel E*), and negative association with CFC ($r(187) = -.313$, $p < .001$, *Figure 5.1, Panel F*), so that higher feelings of deprivation were associated with increased impulsivity, and decreased consideration of future consequences. Excluding the lack of association with indirect aggression, these results are consistent with the pre-registered predictions and with those found in Study 3.

Higher PRD scores were also negatively associated with the single item questions regarding social position, so that participants with higher personal relative deprivation scores regarded themselves as having lower current personal social position ($r_s(190) = -.469$, $p < .001$); lower family social position during development ($r_s(187) = -.235$, $p = .001$); rated themselves as having worse living conditions relative to other in the UK ($r_s(187) = -.447$, $p < .001$), and others in their local area ($r_s(187) = -.196$, $p = .007$); and rated themselves as

having lower income relative to others in the UK ($r_s(187) = -.491$, $p < .001$), and others in their local area ($r_s(187) = -.276$, $p < .001$).

Table 5.7

Bivariate (Pearson's) Associations for all Key Variables, Including Masculine Honor Ideology (MHI); Personal Relative Deprivation (PRD); Interpersonal Aggression; Impulsivity (EIS); and Consideration of Future Consequences (CFC) Scores

Measure	Statistic	MHI	PRD	Overall aggression	Direct aggression	Indirect aggression	EIS
Personal relative deprivation (PRD)	r	.192	-	-	-	-	-
	p	.009	-	-	-	-	-
	N	186	-	-	-	-	-
Overall aggression	r	.340	.193	-	-	-	-
	p	<.001	.008	-	-	-	-
	N	192	189	-	-	-	-
Direct aggression	r	.348	.228	.864	-	-	-
	p	<.001	.002	<.001	-	-	-
	N	192	189	195	-	-	-
Indirect aggression	r	.258	.120	.900	.557	-	-
	p	<.001	.099	<.001	<.001	-	-
	N	192	189	195	195	-	-
Impulsivity (EIS)	r	.141	.202	.085	.130	.027	-
	p	.052	.006	.239	.071	.704	-
	N	191	188	194	194	194	-
Consideration of future consequence (CFC)	r	-.156	-.313	-.099	-.108	-.070	.497
	p	.031	<.001	.168	.132	.333	.001
	N	192	189	195	195	195	194

MHI scores showed moderate positive associations with overall ($r(190)$ = .340, $p <$ .001; *Figure 5.2, Panel A*), direct ($r(190)$ = .348, $p < .001$; *Figure 5.2, Panel B*), and indirect aggression ($r(190)$ = .258, $p < .001$; *Figure 5.2, Panel C*); and a weak negative association with CFC ($r(190)$ = -.156, $p = .031$; *Figure 5.2, Panel E*); indicating that increased endorsement of masculine honour ideology was associated with increased aggression, and a slight tendency for decreased consideration of future consequences. The association between MHI and EIS approached significance ($r(189) = .141$, $p = .052$; *Figure 5.2, Panel D*), so that there was a tendency for higher endorsement of masculine honour ideology to be weakly associated with increased impulsivity. There was also an unpredicted positive association between MHI scores and one of the personal social position items, regarding how participants rated their income relative to others in their local neighbourhood ($r_s(190)$ = .222, $p = .002$; *Figure 5.3*); so that those who scored higher in masculine honour ideology, had a general tendency to rate themselves as having better incomes than others in their local neighbourhood. No associations were found between MHI and any of the remaining personal social position items (*Appendix T*), regarding living conditions, family or personal position in society, or income relative to others in the UK overall.

Further associations were found between some of the measures of personal social position and cognitive risk-factors for violence. Consistent with the results of Study 3, there was a positive association between current perceived personal social position and CFC (r_s (193) = .177, $p = .013$; *Appendix U, Figure 8.21*). However, contrary to Study 3, there was also a positive association between CFC and ratings of income (r_s (193) = .155, $p = .030$; *Appendix U, Figure 8.22*), and living conditions (r_s (193) = .164, $p = .022$; *Appendix U, Figure 8.23*), relative to others in the UK. Participants' CFC scores did not show the association found in Study 3 with ratings of living conditions relative to others in their local neighbourhood (r_s (193) = -.010, $p = .891$). Consistent with Studies 2 and 3, CFC was not found to be associated with ratings of income relative to local others (r_s (193) = .047, $p = .518$). Direct aggression was only found to be significantly associated with ratings of living conditions relative to others in the UK (r_s (193) = -.174, $p = .015$; *Appendix U, Figure 8.24*). This is inconsistent with the results of Study 3, which found direct aggression to be associated with perceived personal social position in society, and perceived family position in society; but not with ratings of income or living conditions. Also contrary to the results of

Study 3, no associations were found between impulsivity and ratings of personal social position.

Figure 5.1

Bivariate (Pearson's) Associations Between Personal Relative Deprivation (PRD) Scores, Masculine Honor Ideology Scores and Risk-Factors for Violence
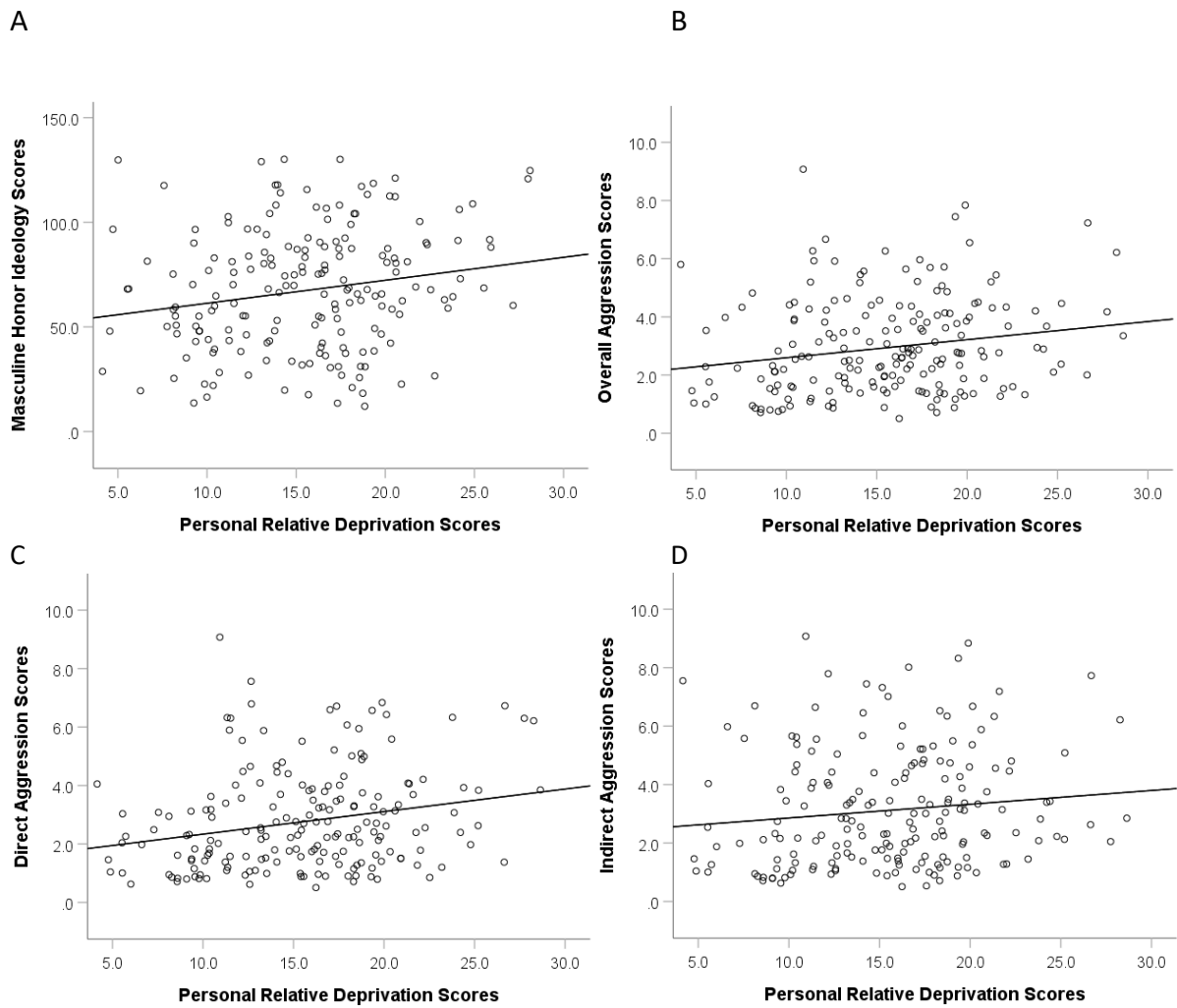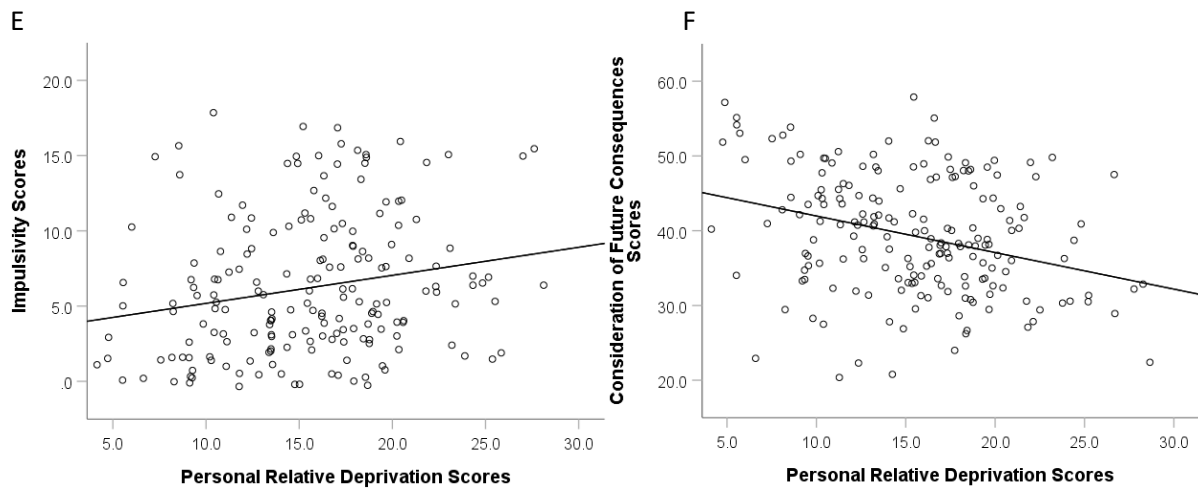
A

B

C

D

Note. Personal Relative Deprivation (PRD) scores were positively associated with Masculine Honor Ideology (MHI) scores (Panel A; r (184) = .192, p = .009), direct aggression scores (Panel C; r (187) = .228, p = .002; and overall aggression scores of r (187) = .193, p = .008 (Panel B); but not with indirect aggression scores (Panel D; r (187) = .120, p = .099). PRD scores were also positively associated with impulsivity scores as measures by the EIS (Panel E; r (186) = .202, p = .006); and were negatively associated with scores on the consideration of future consequences (CFC) scale (Panel F; r (187) = -.313, p < .001). Graphs include linear fit lines and jitter to reveal overlapping scores.

Figure 5.2

Bivariate (Pearson's) Associations Between Masculine Honor Ideology (MHI) Scores and Risk-Factors for Violence

A

B

C

D

E
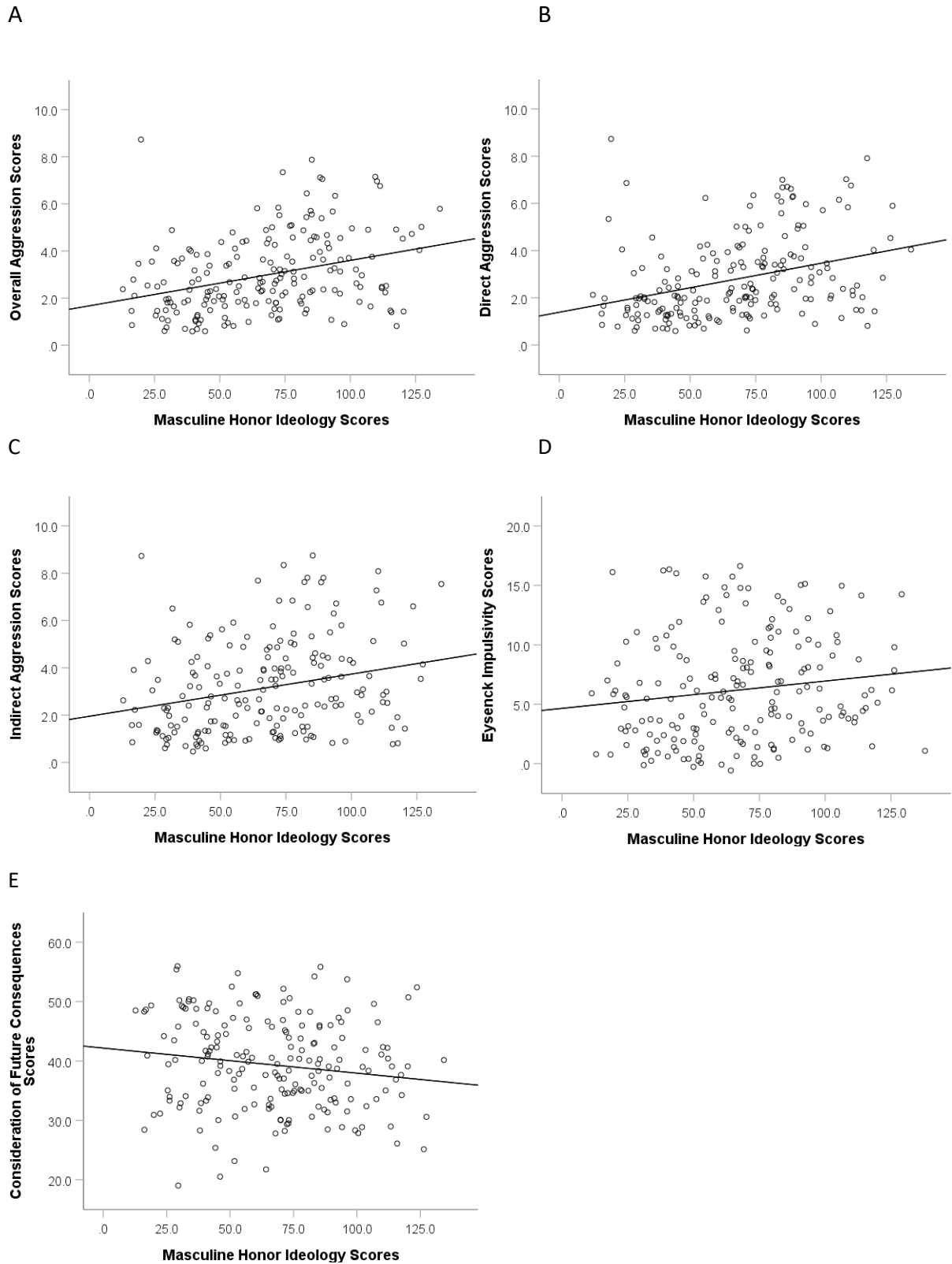
Note. Masculine Honor Ideology (MHI) scores were positively associated with both direct aggression (Panel B; r (190) = .348, p < .001; and indirect aggression scores (Panel C; r (190) = .258, p < .001); giving an association with overall aggression scores of r (190) = .340, p < .001 (Panel A). MHI scores were also negatively associated with scores on the consideration of future consequences (CFC) scale (Panel E; r (190) = -.156, p < .031). The positive association between MHI scores and impulsivity scores on Eysenck's Impulsivity Scale (EIS) was close to significant, r(189) = .141, p = .052. Graphs includes linear fit lines, and jitter to reveal overlapping scores

5.3.3.1. *MHI vs Income Ratings Relative to Others in Neighbourhood*

Figure 5.3

Association (Spearman's) Between Ratings of Personal Income Relative to Others in Participants' Relative Neighbourhoods and Masculine Honor Ideology Scores
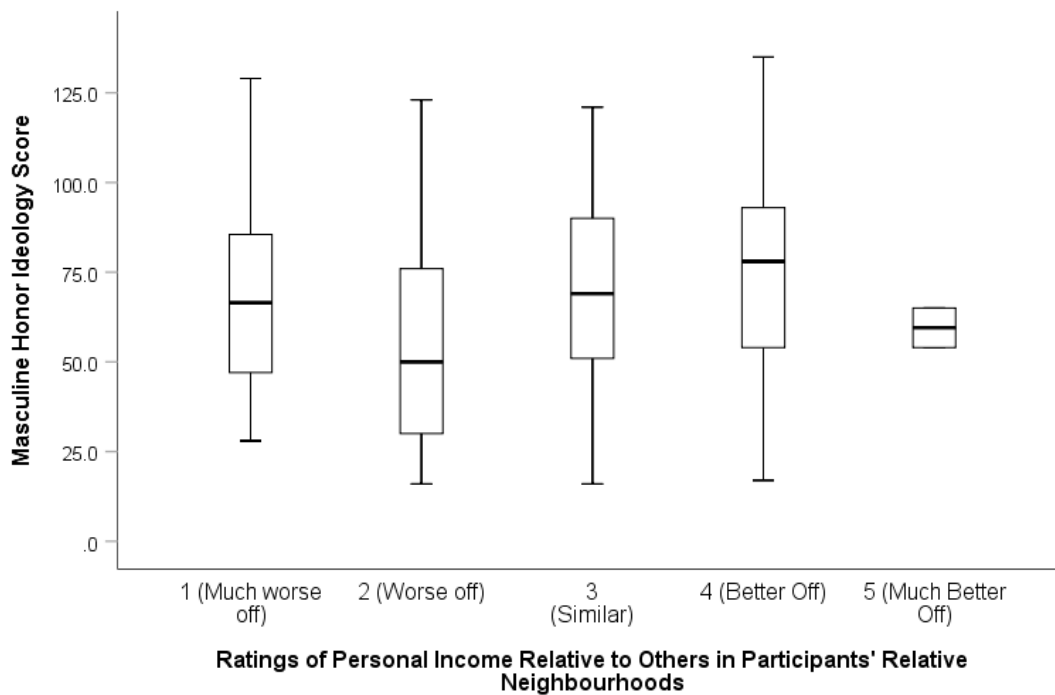
Note. Participants are grouped according to their answer to the question "In general, how do you rate your income compared to those of other people in your local area / neighbourhood?". Spearman's rho test showed that ratings were positively associated with Masculine Honor Ideology (MHI) scores, r_s = .22, p = .002.

5.3.4. Relationships Between Demographic Variables and Dependent Variables

As specified in the pre-registration, relationships between demographic variables (age, employment status, educational level, self-reported income) and the dependent measures were examined on an exploratory basis. As seen in Table 8, age only showed a near significant relationship with impulsivity, so that younger participants showed a weak tendency to score higher in impulsivity ($r(192) = -.140$, $p = .051$). Higher education levels were weakly associated with higher endorsement of masculine honour ideology ($r_s(190) = .169$, $p = .019$), increased consideration of future consequences ($r_s (= -.166$, $p = .022$), and moderately associated with decreased impulsivity ($r_s(193) = -.203$, $p = .004$). Higher personal income was significantly associated with decreased consideration of future consequences ($r_s(187) = -.356$, $p < .001$). The very small number of participants who did not report their ethnicity as being British (or one of its constituent countries) meant it was not possible to compare scores for the dependent variables between ethnic groups.

Table 5.8

Bivariate Associations Between Demographic Variables (Age, Level of Education Completed, and Person Income) and Dependent Variables

Demographic variable	Statistic	MHI	Overall aggression	Direct aggression	Indirect aggression	Impulsivity	CFC
Age	r	-.038	-.133	-0.13	-.106	-.140	.134
	p	.602	.064	.070	.140	.051	.061
	N	192	195	195	195	194	195
Highest level of education completed	r_s	.169	-.018	.041	-.038	-.203	.166
	p	.019	.808	.567	.600	.004	.022
	N	192	195	195	195	195	189
Personal income per year (before tax and deductions)	r_s	.139	-.048	-.018	-.076	.129	-.356
	p	.055	.508	.806	.288	.073	<.001
	N	192	195	195	195	195	189

One-way ANOVAS were used to compare the means of the dependent variable scores between the employment status groups, and found no significant differences were found in MHI scores (F (8, 183) = .584, p = .791); direct aggression scores (F (8, 186) = .376, p = .932); indirect aggression scores (F (8, 186) = .513, p = .845); impulsivity scores (F (8, 185) = 1.860, p = .069); or CFC scores (F (8, 186) = 1.158, p = .327.

5.4. Discussion

As predicted, perceptions of personal relative deprivation were significantly associated with various psychological risk factors for violence, as well as our novel variable of interest; Masculine Honor Ideology (MHI). Personal relative deprivation (PRD) scores were significantly negatively correlated with consideration of future consequences (CFC) scores, and positively correlated with direct aggression, impulsivity scores, and HIM scores, but not with indirect aggression (see Table 6 for full set of bivariate correlations). A multivariate GLM confirmed PRD to be a significant covariate of the dependent variables, with follow up ANOVAs again showing PRD to significantly predict direct aggression, CFC, impulsivity, and MHI scores, but not indirect aggression.

These results are consistent with predictions made in the pre-registration and with results from Study 3 showing PRD to be associated with psychological risk-factors for violence (in the form of impulsivity, CFC and self-reported direct interpersonal aggression), and are consistent with predictions that feelings of PRD could be associated with the endorsement of beliefs related to masculine honour; which has strong theoretical ties to the use of violence to defend status.

The results of the current study are consistent with the possibility that economic factors affecting perceptions of personal relative deprivation, could contribute to the regional variation in the establishment, and maintenance of "cultures of honour"; and therefore also indirectly to levels of violent crime. The association between PRD and MHI suggests that adherence to masculine ideology may be related to an individual's socioeconomic circumstances; and consequently an individual's adherence to MHI need not necessarily be a part of a self-perpetuating 'cultural hangover', as theorised by Nisbett and Cohen (1996). It is possible that there is an interaction between culture and socioeconomic factors that contribute to the extent to which an individual adheres to MHI. The fact that current individual variation in endorsement of masculine honour beliefs is associated with their feelings of PRD, suggests that current socioeconomic experiences may play a part in the formation and maintenance of these beliefs.

In regard to determining whether feelings of personal relative deprivation, (arising from high levels of socioeconomic inequality) have played a role in the formation of the Southern culture of honour described by Nisbett and Cohen (1996), there are a few

considerations that should be made. Nisbett and Cohen (1996) described a compelling account of the history of herders immigrating to the Southern states in the USA, and the intense levels of competition within those states, requiring men to appear formidable in order to protect their resources and family. As explained previously, this is not too far removed from the concept that inequality intensifies competition, and leads to increased willingness to use violence to protect one's status. The results of Studies 2-4 suggest that it is feelings of relative deprivation, rather than explicit perceptions of overall levels of inequality, or perceptions of one's position within society, that is associated with changes in cognition that increase one's proclivity for violence. Study 4 showed that PRD is also associated with endorsement of masculine honour ideology, suggesting that this may be the aspect of inequality that leads to the formation of these beliefs, and in turn, an increased likelihood of violent behaviour towards other men.

However, it should be considered whether, in the environment described by Nisbett and Cohen (1996), the individuals described as using violence as a means of protection (herders) would have been the individuals that felt deprived. The thieves may have been more compelling candidates as individuals who may have been experiencing PRD, and inequality and poverty has been shown in several studies to be associated with property crime (e.g. Bourguignon, 2000; Witt et al, 1998; 1999; Fafchamps & Minten, 2003); but the emphasis in masculine honour ideology appears to be more on the *protection* of one's property and status. If it was the case that the herders themselves were also feeling relatively deprived (assuming the herders and the thieves are not the same people), it is not clear who their reference was, where they were located, or whether the baseline came from prior experiences (personal or observed). Studies 2 to 4 attempted to elucidate the scale of people's reference groups on which people judge levels of inequality, and the cues that signal one's relative status (in the form of perceived relative income or living conditions), but did not find any consistent relationships between any of the factors investigated and the included cognitive risk-factors for violence. It is likely that the question of one's reference group in a modern population sample is further complicated by exposure to media. The scale and characteristics of one's reference group may vary between individuals. Regarding the concept that perceptions of inequality could be affected by prior experiences, one should also consider that one's environment during development can affect brain

development, cognition, and behaviour during adulthood. For example, as discussed in Study 2, low childhood SES is associated with differences in neurological processing (Hackman & Farah, 2009), and with violent behaviour during adulthood (e.g. see Dubow et al, 2016). The questions regarding family social position during development in Studies 2, 3, and 4 did not show consistent associations with risk-factors for violence. However, as has been noted throughout the current thesis, the stronger associations between PRD and risk-factors for violence suggest that one's subjective experience is important. The lack of consideration to one's subjective experience in these childhood status measures could account for the lack of associations. One avenue for future research could be to investigate subjective experiences of deprivation during childhood, and associations with cognition, adherence to MHI, and psychological risk-factors for violence during adulthood. This could indicate whether prior experiences could in any way have contributed to feelings of deprivation, or adherence to MHI, in early settlers of the Southern states. In any case, without empirical data from the time that herders first emigrated to these Southern American states, it is impossible to determine with any certainty whether feelings of deprivation were associated with, or responsible for the endorsement of these beliefs in these states at that time

It should also be considered that another candidate for the initial formation the masculine honour culture amongst 'Southerners', is an explicit awareness of the high competition for resources (an 'awareness' that could have been formed either as a result of one's present conditions, or during their development). This would be consistent with descriptions of the culture that articulate the importance of protecting one's property and status. This is demonstrated on Nisbett and Cohen's (1996, p. 4) description of the culture of honour amongst herders in the South, as being characterised by a preference to use violence to address threats to property or status. Of the 16 items of the MHI, 3 mention using violence to address threats to personal property. This is not sufficient however, to form any real conclusions. Descriptions of honour cultures primarily concern, unsurprisingly, the protection of threats to one's honour; their status; their reputation; something that would be important for early Southern herders, regardless of whether they were experiencing feelings of deprivation, or if they explicitly perceived the intense competition for resources. Whether or not it was PRD that led to the formation of this culture, there is

good reason to believe it has evolutionary roots in how males respond to increased intra-sexual competition; as PRD will theoretically arise more frequently within a population when inequality, and consequently status competition, is higher.

Another reason to suspect that it is some aspect of inequality *other* than PRD that may be most closely related to endorsement of masculine ideology, is that the current study showed an unexpected positive association between MHI scores and perceived personal position in society. This means that there was a weak trend for those who perceived themselves as being higher status, to have stronger adherence to masculine honour ideology. These results appear to contradict the weak association between feelings of deprivation and adherence to masculine honour ideology that was also found in the study. However, it may also signify that men who hold these beliefs are measuring their 'place' in society by some other means than their economic status. However, it should be noted that this positive association was only present for one measure of personal social position, and so is likely to be spurious. Further investigation is needed in order to clarify the intricacies of the possible relationship between the experience of inequality and endorsement of masculine honour beliefs.

Whether or not PRD was involved in the formation of the Southern culture of honour, the current association between PRD and endorsement of MHI suggests that it may play a role in maintaining cultures of honour, but there are 2 factors that should be considered when interpreting the data from the current study in relation to this. The use of a UK sample; and the use of survey data.

As the sample consisted of UK residents, using their data to form conclusions about another culture could be argued as inappropriate. Particularly in a country like the UK, which unlike the US South, has a more diffuse distribution of subcultures that could be considered as endorsing masculine honour, and overall has relatively low levels of homicide. However, these masculine honour beliefs are not exclusive to the Southern states of the US; it is an aspect of individual differences that has been documented in individuals in multiple countries (e.g. see Guerra et al, 2013; Nawata, 2020; van Osch et al, 2020). The current study was based on the prediction that these beliefs are an aspect of an evolved cognitive response to inequality. If experiencing inequality could be shown to be associated with the endorsement masculine honour beliefs in a sample outside of that Southern culture, this is

suggestive that inequality *could* be involved in the extent to which one holds these beliefs *within* that culture. Any decreased adherence within a population sample is more likely to hide any existing associations due to lack of variation, rather than show non-existing ones. The current study showed a present, albeit weak association between PRD and endorsement of masculine honour beliefs. The fact that an association was found between PRD and MHI even in a country that is not reputed as having a Culture of Honour is compelling. This suggests that investigating further into whether the experience of inequality (whether PRD, or otherwise) relates to endorsement of masculine honour ideology, within a state that has this Culture of Honour, could be valuable. Nisbett and Cohen (1996; p. 93) argue that in the situation that the ideals of a culture of honour are attributed to beliefs about "gender roles"; it becomes self-sustaining; no longer subject to the sociological influences that initiated its existence; and therefore can become increasingly difficult to change. As discussed by Daly (2017; pp. 145 – 146), if inequality does play a role in the maintenance of the Culture of Honour in the South, then this provides opportunity for change. This means that the question of whether Cultures of Honour are self-perpetuating, or whether they are maintained by inequality, is an important one to try and answer.

A limitation of this study is with it being a survey study, it relies on self-report, and can be subject to social desirability bias, particularly in a UK sample that is not reputed as having a Culture of Honour. However, any effect of social desirability on participants' reporting of adherence to masculine honour ideology or risk-factors for violence, is more likely to hide or weaken any associations that are present, rather than create non-existent ones. Despite the potential for social desirability to result in under-reporting of these attitudes and characteristics, significant associations were found. The fact that the topic concerns one's attitudes means it is difficult to translate this to non-self-report methods; but there is potentially the option of investigating the topic using behavioural of physiological measures in future research; potentially similar in nature to the 'bump in the hallway' research by Nisbett and Cohen (1996). Research investigating how physiological arousal in response to threatened status may vary between individuals as a function of their PRD, or another aspect of their socioeconomic status, could provide empirical support for the theory that is less vulnerable to social desirability bias.

One strength of the current Study was that, as a result of using an online participant recruitment platform (Prolific Academic), it was less heavily represented by students than Study 2; and so is more representative of the general population. Another strength of the study was that it was pre-registered. This provides transparency, and has the added benefit of providing evidence that the methods and analyses in the research were decided a-priori, demonstrating the integrity of the research.

It should be noted that whilst PRD was associated with MHI, PRD's association with risk-factors for violence (impulsivity, CFC, and self-reported interpersonal aggression) showed stronger associations with PRD than MHI did. MHI was more strongly associated with both direct and indirect aggression than did PRD, which itself had a moderate association with direct aggression only. The comparative weakness of the association between PRD and MHI calls into question its validity. There is not sufficient evidence to conclude for example, that MHI mediates the effect of PRD on any of the other cognitive risk-factors, such as impulsivity, consideration of future consequences, and interpersonal aggression. Particularly in the absence of reports of real incidents of violent behaviour, it is difficult to draw any conclusions whether MHI has the potential to be involved with the cognitive mechanisms that link inequality and violence at the individual level. As mentioned previously, other aspects of inequality (such as explicit perceptions of the level of competition for resources or status) could potentially have stronger links with the development of MHI, and this is something that can only be determined through further research looking to replicate the association with PRD, or find further associations with other, novel aspects of inequality that have not yet been investigated.

The results from the current study provide further support for the association between feelings of personal relative deprivation (PRD) and cognitive risk-factors for violence, in the form of impulsivity, interpersonal aggression, and decreased consideration of future consequences (CFC). Some support was found for an association between PRD and endorsement for masculine honour ideology (MHI), but the relativeness weakness of the association compared to the other risk-factors for violence suggests that further research should be carried out on this topic. Further research could look to replicate the associations found here; whether MHI mediates the association between inequality with risk factors for violence; whether MHI is more strongly associated with other aspects of inequality; and look

at how inequality may be associated with behavioural or biological measurements of risk-factors for violence. As explained previously, the importance of knowing whether economic factors play a role in maintaining cultures and attitudes that endorse violence is considerable. If these are being maintained, rather than being purely self-perpetuating; it means they can be changed.

6. General Discussion and Conclusions

6.1. Thesis Aims

Prior epidemiological research has provided substantial evidence of a relationship between economic inequality and violent crime (e.g. Daly et al, 2001; Elgar & Aitken, 2011; Gartner, 1990; Krohn, 1976). The purpose of the empirical research reported in the present thesis was to further understand the nature of this inequality-violence relationship that had been demonstrated in previous large-scale studies. More specifically, it was intended to improve the understanding of individual level psychological processes that lead to these large-scale relationships seen across the globe. More specifically again, the intention was to better understand the psychological mechanisms that link experiences of inequality with the behavioural outcome of violence. Evolutionary psychological theory on male-intra-sexual competition was used to facilitate the interpretation of this association, and was further used to inform the design and interpretation of the studies throughout the present thesis.

6.2. Overview of Findings

6.2.1. Study 1 (Chapter 2)

The purpose of the initial empirical investigation was to further substantiate the inequality-violence association, but in a different context than previously demonstrated. Previous studies were at low geographical resolutions, for example making comparisons between countries (Elgar & Aitken, 2011; Gartner, 1990), or states (Kennedy et al, 1996), and had often used homicide rather than the broader category of violent crime as their dependent variable (Elgar & Aitken, 1990; Gartner, 1990; Kennedy et al, 1996), and had neglected the United Kingdom. Study 1 investigated the relationship between economic inequality and primarily non-lethal violence at a greater level of geographical resolution than had previously been investigated; looking at this relationship across London Wards which have an average population of approximately 6500 people (ONS, 2012, November 23).

The study was able to look inequality within these electoral wards, by using a Gini coefficient which quantified income inequality between smaller geographical units (LSOAs) within each ward. It then examined predicted associations between this measure of inequality and violent crime within two datasets representing levels of violence in London;

Metropolitan Police recorded violent crimes, and the number of assaults recorded by the London Ambulance Service for each ward. Gini coefficients remained significant predictors of rates of violence in both datasets when average income was included in regression models.

The significant results in study 1 showed that the inequality-violence association is maintained at local resolutions; using two separate sources of data that are not exclusively comprised of cases of lethal violence; building a case for further investigation into individual level mechanisms that may drive this association. Furthermore, when considering what cues might connect economic conditions and violent behaviour at the individual, the fact that variation in levels of violent crimes were associated with variation in inequality at a local level, suggested the that cues to inequality that are responsible for this relationship may be local in nature (e.g. individuals may form perceptions on inequality or one's personal social standing based on comparisons with local others). This led to the design of Study 2 which aimed to explore these underlying mechanisms; something that would only be possible to achieve in an individual level investigation.

6.2.2. Study 2 (Chapter 3)

To attempt to understand the psychological mechanisms that underpin associations of the type found in Study 1, an exploratory study initiated the individual level investigation into the inequality-violence association. There were multiple avenues explored in an attempt to start to develop an understanding as to what proximate psychological mechanisms drive the inequality-violence association at the individual level. The primary aim of the investigation was to elucidate which perceptions related to inequality were associated with risk-factors for violence. Participants were asked about their perceptions of inequality at a national and local level, and their relative social standing. Specific avenues explored were their perceptions of local inequality versus national inequality (based on a pictorial measure used by the International Social Survey Program; ISSP, 2017); current versus historical familial social position; and perceptions of their relative income and living conditions (at both a local and national level); using measures based on a question from the Afrobarometer, (2005). Analyses were carried out to determine whether any of these factors related to perceptions of inequality were associated with risk-factors for violence in the form of self-reported interpersonal aggression (Griskevicius et al, 2009), and the extent

to which they consider future consequences (CFC; Strathman et al, 1994) when making decisions.

This aimed to elucidate issues such as whether everyone is affected by inequality regardless of social position, whether relative position is the only important factor or whether the two interact. The measures used to investigate these topics were based on measures used repeatedly in national surveys, with published results, including from independent researchers (ISSP: Brunori, 2017; Hadavand, 2017; Niehues, 2014; Gimpelson & Treisman, 2018; Afrobraometer: Rustad, 2016; Chang, 2007). The current versus familial social position questions aimed to elucidate whether there was a lag in the effects of inequality, as had been indicated as a possibility in previous literature (Daly, 2017, pp. 151-152; Zheng, 2012), and consistent with the concept that the environment can affect one's cognitive development. The living conditions questions aimed to look at whether cues that are indicative of social position are more important than explicit perceptions of social position, in regard to one's proclivity for violence.

No associations were found between perceptions of the level of local and national inequality and the measured psychological risk factors for violence. However, it was not clear whether this is due to the fact that no association exists, or whether the pictorial method used to measure these inequality perceptions (ISSP, 2017) was difficult for participants to interpret. However, there were also no associations found between the measures risk-factors for violence and the measures of social position. It was not clear whether this was due to using inappropriate measures of social position, or whether the chosen risk-factors for violence are simply not relevant to the inequality-violence association. It was determined that both the measures of inequality and the measured risk-factors for violence needed to be expanded in the following investigation.

6.2.3. Study 3 (Chapter 4)

Study 3 refined the investigation by including a further measure related to inequality, focusing instead on how may people may subjectively experience the consequences of inequality, rather than explicit perceptions of their position, or cues to their position. The Personal Relative Deprivation (PRD) scale (Callanet al, 2008; Callan et al, 2011) measures the extent to which the respondent felt deprived relative to others 'like them'. This was a previously validated instrument which had previously shown associations

with various risk-related behaviours, and which allowed for respondents to relate themselves to whichever reference group was most salient to them (rather than specifying comparison to others in their local area, or everyone in their country).

Further psychometric measures of traits generally associated with criminal behaviour were included in the study, as candidate proximal psychological factors, including impulsivity, and a proclivity for risk-taking (e.g. see Dahlbäck, 1990; Gordon & Egan, 2011; Mishra et al, 2017). These were measured using the Evolutionary Risk Scale (Wilke, et al, 2014), which has the added benefit of separating risk-taking behaviour into domains informed by evolutionary theory; and Eysenck et al's (1985) impulsivity subscale from the Impulsiviness, Venturesomeness, and Empathy Inventory (Eysenck et al, 1985), a measure which has specifically shown associations with violent crime in previous research (Gordon & Egan, 2011).

Results from Study 2 were replicated in Study 3. However, the additional measure regarding participants' subjective experiences of inequality, PRD, was shown to be associated with all measured psychological risk factors for violent and criminal behaviour, including CFC.

The results from Study 3 provide the foundations of an empirical basis of evidence for the individual level associations that are likely to be contributing to the robust, inequality-violence associations seen in large-scale epidemiological data. Namely that feelings of deprivation resulting from inequality may increase the risk of violent behaviour by increasing levels of interpersonal aggression, impulsivity, risk-taking in between-group competition domains, and decreasing the extent to which considers future consequences when decision making (or causing one to have more of a focus on the present). It is the beginning of an improved understanding of how inequality might lead to violence, which could increase opportunities for intervention, whether that be on a large scale or on a case-by-case basis.

6.2.4. Study 4 (Chapter 5)

Study 4 extended the findings of Study 3 by investigating a further important cultural variable that may predict the likelihood of men in particular getting involved in interpersonal violence. Nisbett and Cohen (1996) had previously criticised research

attributing geographical variation in homicides to economic factors, for not taking cultural factors into account. They have argued that the higher rates of violence seen in the Southern US States (relative to Northern US States) are due to a culture of violence that formed as a result of the conditions experienced by the early settlers, who were primarily herders, that initially settled there. They argued that the geography of these areas meant that little protection was offered from law enforcement. Herders were therefore required to rely on their reputation as formidable opponents to protect themselves from theft, making them sensitive to any threat to their reputation. Furthermore, Nisbett and Cohen (1996) assert that this culture is self-perpetuating and need not be maintained by economic factors. In Study 4, parallels were drawn between the environment experienced by early settlers in the South, and environments high in inequality, in regard to the intensity of intrasexual competition, and competition for resources. In order to gain some insight into whether inequality may perhaps play a role in the formation and maintenance of cultures of honour, Study 4 investigated the associations between masculine honour beliefs, using the Masculine Honour Ideology (MHI) scale (Barnes, Brown & Osterman, 2012) and perceptions of PRD. The study also aimed to replicate findings in Studies 2 and 3; and so included the previous measures of inequality and personal position, as well as risk-factors for violence, in the form of CFC (Strathman et al, 1994), impulsivity (Eysenck et al, 1985), and interpersonal aggression (Griskevicius et al, 2009).

In this study, PRD was significantly associated with the endorsement of masculine honour beliefs, and with risk-factors for violence, including impulsivity, CFC, and direct interpersonal aggression; corroborating the findings of the Study 3, although no association was found with indirect aggression. Whilst some associations were found with perceptions of overall inequality and perceptions of social position (developed for Study 2), associations between PRD and psychological risk factors for violence were more robust across analyses.

6.2.5. Interpreting the Findings as a Whole

The studies in the current thesis corroborate the association between economic inequality and violence seen in previous epidemiological research (e.g. Daly et al, 2001; Elgar & Aitken, 2011; Gartner, 1990; Krohn, 1976), and provide some insight into the proximate psychological mechanisms that may drive this association. Findings suggest that it is the feeling of being relatively deprived that is associated with psychological risk-factors

for violence, including aggression, impulsivity, and less consideration of future consequences. Findings do not suggest that explicit perceptions of the level of inequality in one's environment, or simply perceptions of one's position in that environment, affect one's proclivity for violence. Findings suggest that experiencing deprivation relative to others as a consequence of living in an inequitable environment, may lead to the development and maintenance of cultures that value masculine formidability, but the relatively weak relationship between Masculine Honour Ideology (MHI) and PRD, compared to that between PRD and other risk-factors for violence, suggests that a slightly different aspect related to the experience of inequality may be more closely related to the development of MHI within individuals; such as, explicit perceptions of competitiveness in one's environment; or previous experience of PRD. However, this could be due to relatively low levels of adherence to MHI existing in the UK compared to areas such as the US South.

6.3. Implications of your findings for existing literature

The existence of the association found between economic inequality and violent crime, in two datasets in the UK, is consistent with the findings and interpretation of studies showing associations between economic inequality and homicide, used as a proxy measure for the level of violent crimes (e.g. Daly, 2017; Daly et al, 2001; Elgar & Aitken, 2011; Gartner, 1990; Krohn, 1976). The association found between PRD and risk-factors for violence also corroborate both the existence of the association and how studies using homicide data have been interpreted by some evolutionary psychologists (e.g. see discussions by Daly, 2017), as reflecting a general tendency for males to show increased proclivity for violence in inequitable contexts. The findings in studies 1, 3 and 4 also corroborate the existence of the association between inequality and violent crime seen in other studies (Kaplan et al, 1996; Kelly, 2000). The findings shown in Studies 3 and 4 address concerns highlighted by Nisbett and Cohen (1996) regarding the aggregated nature of previous research showing the association between socioeconomic factors and violence, as they were able to show the association at the individual level.

Taken together, the findings of the studies in the current thesis are not consistent with research showing no association between inequality and violence. For example in a study comparing regions in the UK (n=10), Wu and Wu (2012) found that income differences between the 1st and 9th deciles of a population were not associated violent crime; only other

kinds of crime. Patterson (1991) found poverty, but not economic inequality, to predict levels of violent crime when comparing 57 residential areas in the US. It is not clear why these Studies show inconsistent results, however the majority of research on economic inequality appears to support the existence of a relationship.

Daly (2017) previously has discussed the possibility that inequity may affect individuals at all levels of the socioeconomic distribution; and that those with more resources at their disposal are able to express any proclivities for risk-taking or impulsivity in more socially acceptable, safer ways. The findings in Studies 2-4 however do not suggest this is the case. Feelings of personal relative deprivation, of the type likely experienced only by people lower in the socioeconomic distribution, were more robustly associated with various psychological risk factors for violence (showing associations across several analyses), but general perceptions of inequality were not generally associated with these psychological risk-factors. However, as noted in the previous chapters, it may be that the ISSP pictorial measures used to depict different levels of inequity in social distributions were difficult for participants to interpret. Future research could investigate this using an alternative measure of overall inequality (that is independent of personal position or subjective experience), in order to determine whether this lack of association is reflective of reality.

The results of Study 4 are not consistent with Nisbett and Cohens (1996) assertion that the high geographical variation in violent crimes, such as in the US, can be explained largely by cultural rather than economic factors. Whilst Study 4 did not take place in the US, cultures related to masculine honour are not exclusive to the United States, and is an aspect of individual differences that has been documented across multiple countries (e.g. see Guerra et al, 2013; Nawata, 2020; van Osch et al, 2020). The UK is not explicitly known for having a particularly strong culture of honour (of the type referred to by Nisbett & Cohen), and as explained previously, low levels of adherence within a population sample is more likely to hide any existing associations due to lack of variation, rather than show non-existing ones. The fact that Study 4 showed an (albeit weak) association between PRD and endorsement of masculine honour beliefs, is despite the lack of a consistent, strong culture of honour in the UK, suggests that socioeconomic factors are likely to be involved in the development of cultures of honour, adherence to MHI within individuals, and by extension their willingness to use violence to defend status.

Moreover, the association found between PRD and MHI and risk-taking related to taking risks in the context of between-group competition, and consequently corroborates the evolutionary explanation for the inequality-violence association described by Daly (2017). The theorised increased importance of status in inequitable contexts is reflected in these results; suggesting that the increased violent crime seen in areas high in inequality, may be the result of human adaptation rather than pathology.

6.3.1. Behavioural Constellation of Deprivation

Previous research has examined behavioural changes associated with experiencing deprivation in general terms (as opposed to specifically just the increased likelihood of involvement in interpersonal violence). For example, in their work on the Behavioural Constellation of Deprivation (BCD), Pepper and Nettle (2017) discuss how low socioeconomic status (SES) is associated with a present time orientation across multiple domains. The results from Studies 3 and 4 are consistent with this framework, showing feelings of deprivation to be associated with traits conceptually associated with present-time orientation, including less risk-taking, impulsivity, and less consideration for future consequences. This present time orientation is said to result from the lack of autonomy that comes with being low SES (Pepper & Nettle, 2017). This is consistent with research showing external locus control to predict violent behaviour, and internal locus of control to be a protective factor (e.g. Ahlin, 2014; Hollin & Wheeler, 1982). Future research could potentially investigate this within the context of deprivation and inequality.

6.4. The Current Understanding in the Field and Unaddressed Issues

As well as corroborating research showing the association between socioeconomic inequality and violent crime, this research fits into the wider field of inequality research, such as that by Wilkinson and Pickett (2009; 2010; Pickett & Wilkinson, 2015), which shows socioeconomic inequality to be associated with a wide range of problematic social issues. Inequality has been shown to be negatively associated with educational attainment (Thorston, 2014), physical health (Fiscella & Franks, 2000; Subramanian et al, 2003), and life expectancy (Wilson & Daly, 1997). It has also been shown to be associated with negative social outcomes such as mental health difficulties (Ribeiro et al, 2017), including depressive (Fiscella & Franks, 2000), and psychotic symptoms (Johnson et al, 2015); mortality rates (Lochner et al, 2001); and rates of teen pregnancies (Gold et al, 2001; Maslowsky et al,

2019). This is consistent with the BCD (Pepper & Nettle, 2017) framework. Outcomes such poor health behaviours (van Beek et al, 2017; Mudd et al, 2021; Tórtora & Ares, 2018); risk-taking (eg. Mishra et al, 2017); sexual risk-taking (e.g. Schweitzer, 2011); and poor educational attainment (e.g. Janeiro et al, 2017), are associated with factors related to a present-time orientation such as impulsivity, sensation seeking, future discounting, and less consideration of the future.

This also fits in with Life History Theory (LHT) which refers to the fitness trade-offs of behaviours; i.e. that investment in one aspect of one's fitness, will often be costly to another aspect of fitness. Life history strategies can be either fast or slow; relating to investment in either short-term fitness (fast life history strategy), or long term fitness (slow life history strategy). Within the context of human evolutionary psychology, LHT describes how one's ecological context can influence the extent to which they follow a fast or slow life history strategy (see Nettle & Frankenhuis, 2020, for an overview of LHT in evolutionary psychology versus biology). Fast life history strategies are said to be employed in more unstable environments (Nettle & Frankenhuis, 2020), and often employ behaviours that have highly variable outcomes (high stakes, high risk, large rewards) (Csathó & Birkás, 2018). Slow life history strategies are often employed in more stable environments, and consist of lower risk-investments in fitness that have less variability in outcomes, have lower stakes, and may take longer to realise rewards (Csathó & Birkás, 2018; Nettle & Frankenhuis, 2020). An environment in which resources are inequitably distributed creates high variability in fitness outcomes for its inhabitants. The use of violence in order to gain or maintain status reflects a high risk, high stakes strategy, which can have a highly variable impact on one's reproductive fitness. However, as explained by Wilson et al (2009), it could be conceived that actually what is 'risky' is relative to the stability of one's environment. Whilst the outcomes of fast life strategies are highly variable, they are in fact the 'safer' bet in an unstable environment where one's future fitness is uncertain anyway; providing, at least, the possibility of achieving goals relevant to one's fitness (also discussed by Mishra et al, 2015). As explained by Mishra (2014), the tendency to make decisions with the potential for highly variable outcomes during times of great need is central to Risk Sensitivity Theory, which was originally used to explain animal foraging behaviour (e.g. Caraco et al, 1980).

These trade-offs in investments into different aspects of fitness (as per LHT), is closely conceptually related to the concept of time orientation. Research has even indicated an explicit awareness in adolescents from unsafe neighbourhoods, that a focus on the present is necessary due to the uncertainty of one's mortality (Tanner & Tanner, 2019). This is especially the case in regards to the use of violence to defend status in an inequitable environment; where low status due an inability to defend or gain status as a formidable opponent, literally can mean the difference between being able to reproduce at all. Conversely, choosing not to engage in these risky-behaviours, and investing physical and cognitive resources into the future (e.g. such as for the purposes of gaining status through less dangerous means, such as via educational and more legitimate forms of professional attainment) could be considered much more risky when one is unlikely to have the capacity to reap those rewards later in life. As described by Pepper and Nettle (2017), low SES individuals are said to have an external locus of control in regards to their life outcomes; reflective of an unstable environment. These slower life strategies are not seen as viable courses of action.

6.4.1. Time-lag

Studies 2-4 asked participants to report their perceptions of their family's place in society during their development. This was due in part to the known importance of one's environment during development and later effects on cognition and behaviour. For example, adverse early life conditions, including socioeconomic deprivation, are known to be associated with earlier reproduction and faster life strategies in women (Dickins et al, 2012; Nettle et al, 2011). Low socioeconomic status has also been associated with differences in neural processing even when controlling for cognitive performance (Hackman & Farah, 2009); and with violent behaviour in adulthood (Dubow et al, 2016). Furthermore, there has also been some evidence suggesting that there may be a temporal lag in the effects of inequality on societal (Daly, 2017, pp. 151-152; Zheng, 2012). However, the current thesis failed to show any clear associations of perceived previous family social position, with psychological risk-factors for violence. For associations that were found (i.e. whilst Study 2 found no significant associations, Study 3 showed significant associations with impulsivity, and direct aggression scores), these were relatively similar in strength to those found with perceived current personal social position. It is difficult to draw any strong

conclusions about the potential of temporal lag from these results, as none of the similarly formatted questions showed clear and robust associations between recollections of early life experiences of socioeconomic position and psychological risk-factors for violence. Future research looking at historical experiences of subjective deprivation, particularly in individuals who have experienced changes in social status, could provide valuable insight into whether these relationships are plastic and responsive to current economic conditions, or whether these associations are formed earlier in life. It is potentially the case that there is an additive effect, which could have significant implications for the effects of long-term inequalities in society.

6.4.2. The Unresolved Matter of Reference Groups

The current thesis was not able to determine the reference groups involved from which one forms their perceptions about inequality or personal social position, or what is evidently more important, their feelings of personal deprivation. At least, not in the context of perceptions that affect their proclivity for violence. The generality of the PRD scale (Callan et al, 2011) allows participants to compare themselves to whoever is most salient to them. Specifically it asks participants to compare their position to "people like me", which had the benefit of allowing us to detect the present relationship with psychological risk-factors for violence, but also leaves the issue of who is included in these reference groups as unresolved. It is also possible that high exposure to social media further complicates this issue; potentially exacerbating the effects of inequality; perceptions of personal relative deprivation. This is particularly important when considering that the filter that social media provides, could create the image of an environment that is more competitive than it actually is. Both social media "influencers" and "regular users" are able to filter their online image to show polished, and inaccurate representations of themselves; so if one was to consider any of these artificial personas to be 'people like them', then this is likely to cause a skewed comparison to the detriment of oneself.

6.4.3. Other Forms of Inequality

Although the research reported in the current thesis focused on psychological and behavioural responses to experiences of economic inequality, considering the theorised underlying factors of status competition and perceived autonomy, it is important to consider that other kinds of inequality may affect cognition and behaviour in the same way.

The discrimination experienced by marginalised people (such as people of colour; PoC), and the effects this has on both social and economic status, and their subjective experience of this, should be considered as a factor that could potentially affect cognition, and risk-factors for undesirable life-outcomes, such as an increased proclivity for violence. This is consistent with the concept of "protest masculinity" in Sociology, which describes a form of aggressive hypermasculinity (Broude, 1990), and is said to arise as a result of oppression, e.g. in working class communities, including PoC (as discussed by Lane-Steele, 2011). Future work could look to integrate aspects of social status, other than one's economic capital, with the theories discussed in the current thesis; particularly in regard to socially discriminated groups, and how these experiences may affect their cognition.

6.4.3.1. Masculine Strategies in Diverse Populations

The research reported in the current thesis focussed on factors that may encourage the development of a particular life history strategy sometimes employed by heterosexual, cis-gendered males. It did not explore the intricacies of gender and sexuality and how these may fit into the theory. It would be unwise to presume that this strategy could never be employed by individuals that not fit into this specific category. For example, Griskevicius et al (2009) showed that female participants also reported status as being their primary motivation for engaging in prior aggressive behaviour. It is not within the scope of the current thesis to discuss these themes in depth, but some literature on the topic of hyper-masculinity, and protest-masculinity, outside of the cis-gendered heterosexual male community does exist. For example, protest-masculinity in some masculine presenting black lesbian working class women, has been described as a protective strategy from the many forms of discrimination experienced by these individuals (e.g. see Lane-Steele, 2011). Notably, Lane-Steele (2011) poses that this strategy affords some protection due to the access these individuals gain to "some levels of male privilege and power" (p 481), suggesting that status competition could potentially also be a factor here. There may be some scope for themes such as these to be explored within the context evolution, economic inequality, and status competition. Investigations such as these should be especially sensitive to the inequalities and discriminations experienced by these individuals; aiming not to vilify them, but to better understanding the processes underlying the relationship between inequality and psychological risk factors for violent behaviour. The ultimate

purpose of investigating this relationship must be to provide opportunity to improve prospects, and quality of life for both potential victims and perpetrators.

6.4.4. Differential Susceptibility

Although the current thesis is informed by evolutionary theory, with the view that the association between inequality and a proclivity for violence is a universal trend, it should be noted that previous research has indicated that the extent to which one is affected by their environment varies between individuals. Differential Susceptibility Theory (Belsky, 1997; Belsky et al, 2007) and Biological Sensitivity to Context Theory (Boyce & Ellis, 2005) suggest that some individuals are genetically predisposed not only to show negative outcomes in poorer ("risk-promoting") conditions, but also to show positive outcomes when exposed to "development enhancing" conditions (Ellis et al, 2011).

One particular DRD4 allele has been found to be associated with higher variation in future discounting as a function of SES; i.e. children with this particular allele showed stronger discounting when growing up in lower SES families, whereas the children with this allele who grew up in more economically advantaged settings showed the least future discounting. Children without this allele appeared to show a mid-level amount of future discounting, regardless of their SES (Sweitzer et al, 2012). This high sensitivity to environmental conditions, for both positive as well as negative outcomes, could have important implications for the efficacy of interventions. This could mean that those individuals who are most at risk of developing a proclivity for violence, are also those who are most likely to develop entirely opposite life outcomes. This is extremely promising for the prospect of interventions. However, as to whether this is promising for rehabilitative interventions, or only for preventative interventions, would need to be determined by research looking at the plasticity of these traits in these individuals.

6.4.5. Emotional Intelligence

Seemingly contrary to the findings in the current thesis, there is some evidence that low SES individuals are actually more likely to help others in need, and score higher in measures of empathy (Manstead, 2018). It is possible that this reflects a higher variation in empathy and helping behaviours in low SES individuals. More research would need to take place in order to see whether these disparate behaviours exist between or within individuals. Depending on the findings of future research, this tendency for higher levels of

empathy in low SES individuals could be utilised in the development of future interventions looking to prevent violent behaviour in those at risk.

6.5. Implications of the Research for Society

The research in the current thesis provides a major empirical contribution to the theories and research presented in previous work (e.g. Daly, 2017; Daly & Wilson, 1990; Dickins et al, 2012; Pepper & Nettle, 2017). In combination with these previous works, the research in the current thesis further contributes towards the future development of a comprehensive theoretical framework that could have a wide breadth of applications in society. A referential framework such as this, that outlines the general mechanisms that link inequality with violent behaviour could make these theories more accessible (or at least, marketable to decision-makers), and therefore could be used to effect change on a large scale; such as when policy making; or designing targeted initiatives (e.g. similar in some respects to the MINDSPACE framework (Dolan et al, 2010), created to facilitate the design of policies informed by nudge theory). It can also be used as a reference when looking at individual level preventative or rehabilitative interventions. Using evolutionary theory to understand some of the previously unaddressed causes and motivations for violent behaviour, as 'normal' responses to one's environment rather than a pathology (Daly & Wilson, 1997), may help to "humanise" a portion of the population that are typically dehumanised (see Vasiljevic & Viki, 2013 for a discussion of the dehumanisation of offenders). This provides more scope for using interventions to effectively change their behaviour rather than taking only a punitive approach, which is the more automatic human response to socially unacceptable behaviours when the perpetrator is perceived as being low in status, unremorseful, replaceable (in terms of their productivity in society), and a member of an outgroup (Petersen et al, 2012). The aim is to not only keep the rest of the public safe and reduce money spent on public services as a result of violent crime, but also to improve the quality of life for those that become involved in it (or at least those at risk of becoming involved). However, as mentioned in the introduction to Chapter 2, any finances saved would be hugely beneficial; particularly at the current time where the country is under considerable financial strain recovering from the impacts of the Covid-19 pandemic.

6.6. Strengths and Limitations

A considerable strength of the research reported in the current thesis, is that a range of methodological approaches and data sources have been used. From epidemiological research to questionnaire studies in a range of populations, using a range of previously validated psychometric tools. Moreover, the results between studies were relatively consistent with one another. Whilst there was a discrepancy between Study 2's lack of significant association between CFC and the inequality measures, and the presence of an association in Studies 3 and 4, this could be attributed to the inadequacy of the inequality measures used in Study 2. Studies 3 and 4 found similarly weak evidence of associations with the Study 2 inequality measures and risk-factors for violence. This consistency between studies was found despite the different sampling methods used. Study 2 recruited participants both from the university student population and the general public via social media on a voluntary basis. Study 3 recruited from the general public via the participant recruitment portal Prolific Academic, which compensated participants for their time. Study 4 also recruited via Prolific Academic, but specifically only recruited male participants. One limitation of recruiting participants using these methods is that it resulted in a sample of participants that had an overall higher level of education than the general population, which is generally associated with higher socioeconomic status. The number of participants who held an A-Level qualification or higher was 79.25% in Study 3, and 80% in Study 4; which is higher than the 65-66% of UK working adults (65% of males and 66% of females) who held a Level 3 qualification or above in 2018 (Department for Education, 2019, November 21). Pursuing education is also likely to indicate that an individual is not following a life history strategy that necessitates violence and/or aggression. However, a limitation such as this is more likely to hide any existing associations with deprivation due to insufficient variation in the socioeconomic position of participants, rather than create spurious associations. The fact that associations were found even in what may have been a relatively homogeneous sample, is compelling evidence for the validity of the associations. However, it also should be noted that with the Study set in the UK and the fact that the majority of participants were Caucasian, there is certainly more scope for increased diversity. Future research should endeavour to recruit more diverse participant samples, and include participants that are more ethnically diverse and from a variety of cultures.

There are also well-established limitations to using surveys in research. They are quasi-experimental in that participants cannot be randomly allocated to groups as is necessary for a truly experimental paradigm. For example, there could be bias in regards to the kind of participants that are likely to sign up to participant recruitment websites and answer paid surveys (such as Studies 3 and 4; people who are educated but doing surveys for quick, small amounts of cash, is a particularly unusual subset of the population), and as well as those that are likely to answer unpaid surveys advertised on social media (as in Study 2; participants may be unusually motivated to help students). The potential for confounding factors to come into play mean that any conclusions drawn from survey data must be interpreted with some caution. The self-report questions in surveys also means that social desirability can potentially influence participants answers, and give results that are unrepresentative. However, despite the socially undesirable nature of the variables of interest, associations were still present in the data. If social desirability were coming into play, it is more likely that this would have obscured any present effects rather than inflating them. The possibility that the data underestimated an effect that was present is more likely. It could be theorised that for those that use aggressive tactics to compete for status, and adhere to masculine honour ideology, this would theoretically mean that they find it more socially desirable to possess these traits. However, it could be argued that many questionnaires are heavily biased by social desirability, and generally tend to use negatively (or positively) valenced phrasing that reflects social desirability biases. In any case, to re-iterate, if any issues with social desirability (or sample bias) were present, it was not sufficient to suppress the predicted associations from being detected.

Despite the previously noted concerns about skewed and relatively homogenous samples, there are also some relative strengths to collecting data using online surveys. A large proportion of psychological research recruits their participants from undergraduate psychology student populations (Kranz & Dalal, 2000); and so whilst the research in the current thesis could certainly benefit from being more diverse in future replications, the use of online surveys did enable the testing of populations outside of this narrow demographic. Surveys also allow for the fast collection of large volumes of data at relatively low expense (Kranz & Dalal, 2000), which facilitates the prospects of future replications.

6.7. Future Directions

6.7.1. Reference Groups

As indicated above, social media may play a role in forming one's perceptions of relative deprivation and competition. Research should investigate how technology such as social media fits into the inequality-aggression association. Social media not only exposes people to heavily filtered, biased content, but could also potentially widen reference groups, affecting perceptions of relative deprivation; and increase the possibility of exposure to status threats. Studies could investigate how what kind of content we view and the frequency at which we view it influences our perceptions of personal relative deprivation and cognitive factors related to violent crime. One example is the debate in recent years about a genre of music called Drill, and the role it may or may not play in gang violence. A large portion of Drill music videos uploaded on social media come from areas at risk of violent crime, often performed by young black men. Subject matter is often violent and has even been used in court as evidence for gang related killings (Swann, 2021, January 13). Whilst the ethics of using an art form such as music as evidence in a murder trial is questionable to say the least; investigating how exposure to certain media content might affect perceptions of competition and subsequently cognition, could be extremely valuable. Research should look at the possibility that media could induce perceptions of personal relative deprivation, due to the biased and heavily filtered content of these platforms, especially considering the emerging evidence suggesting that social media use can negatively affect self-esteem, social anxiety (Jiang & Ngien, 2020, Cookingham et al, 2015), and may even normalise high-risk behaviours amongst adolescents (Cookingham et al, 2015).

Other avenues of research include looking at whether social media increases exposure to personal threats to status (whether that be by being mentioned in music videos by local artists, or other social media context such as Facebook, Twitter, Instagram and TikTok). The potency of these threats relative to 'real world' threats is also worthy of investigation. Before the wide-spread use of social media, Wilson and Daly (1985) reported that trivial altercations that threaten one's status initiate most cases of homicides. A 'diss' on social media has the potential to reach a much wider audience and could potentially have serious (real or perceived) effects on status; but equally could have a dulled effect due

to the inhuman nature of the online environment. Innovative data collection methods using social media may provide us with the means to address these unanswered questions. For example, Twitter data has been used to investigate the types of users who tweet about politics (Bekafigo & McBride, 2013); and enabled the investigation of over 10 million users in a study looking at public opinion leaders in the Turkish Twitter user-space (Gökçe et al 2014). Another Twitter study investigated associations between SES, geographical factors, and activity patterns (Huang & Wong, 2016). Future studies could use the data available on social media to investigate, for example, associations between the interaction with content regarding themes such as status, violence, or wealth, and their own activities or characteristics. Alternatively, participants could be recruited and investigated using a combination of traditional testing methods such as behavioural or survey testing, alongside investigation of their personal social media exposure, interaction, and usage.

6.7.2. Protective Factors

Future research could investigate protective factors that may be involved that could be implemented as preventative or rehabilitative measures. Whilst previous research in criminology has investigated protective factors for criminal behaviour, this has not been investigated within evolutionary-based framework, taking into account status as a driving factor.

6.8. Final Concluding Comments

The epidemiological research reported in this thesis has shown that the association between economic inequality and violence can be seen across small scale geographies, and when using data on interpersonal violence from independent data sources. Moreover, the questionnaire studies have made an important contribution to advancing our understanding of the psychological underpinnings of this association. For example, showing that feeling deprived relative to others (a likely consequences of inequality for some) is associated with various psychological risk-factors for involvement in interpersonal violence such as less consideration of the future, greater impulsivity, and a tendency to take risks in key domains.

Whereas traditional criminological perspectives might, somewhat pejoratively, view these psychological outcomes as in some way "pathological", the evolutionary psychological perspective adopted here allows them to be viewed differently. As eloquently explained by

Pepper and Nettle (2017) the present-focused behaviours associated with lower socioeconomic status (i.e. the behaviours associated with relative deprivation) are best viewed as "a contextually appropriate response to structural and ecological factors rather than a pathology or a failure of willpower." (Pepper & Nettle, 2017, p. 1). That is, responses that at least had adaptive value during key parts of human evolutionary history. As explained above, understanding this is important because it humanises those at risk, allowing for the development of more targeted, effective interventions to be developed. The results from these studies are only the beginning of an improved understanding of the relationship between inequality and violence, and more needs to be done in order to support and expand these findings to better understand how inequality affects human behaviour in the modern society.

As final note, it is important to acknowledge that even if research is able to fully elucidate the common proximal mechanisms involved in the inequality-violence link, and how to apply this model to reduce violent behaviour amongst individuals, this alone will never be sufficient. Socioeconomic conditions create the circumstances under which some people experience extreme relative deprivation, so political will would be needed to tackle the processes which generate these conditions. Moreover, it needs to be ensured that social and political structures to support these individuals with alternative routes to success are in place. It is imperative that the well-being and economic security of these individuals is supported if any lasting change can ever be expected. Cultural attitudes and classism within universities for example can mean that upward social mobility in these socially acceptable routes may seem impossible and even undesirable (e.g. see Brook et al, 2014). Research has shown that first generation university students can feel culturally mis-matched, affecting their well-being and even their academic success (e.g. as discussed by Hecht et al, 2021). Moreover, it should be considered that even if upward mobility becomes accessible for more people, whether this could merely intensify the experience of deprivation amongst those who are not inclined (due to ability, circumstance, or otherwise) towards the kinds of careers that are paid wages that enable economic security.

It is ultimately the responsibility of researchers and policy makers to ensure that these issues are considered, and addressed with care.

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8. Appendices

8.1. Appendix A - Inequality in the Media

Articles in the Guardian

- "How the Super Rich Got Richer: 10 Shocking Facts About Inequality." (Dorling, 2014, September 15).

'The Inequality Project' articles

- "Inequality Index: Where are the World's Most Unequal Countries?" (Barr, 2017, April 26).

- "The Study that Shows Life is a Lot More Unequal Than You (Probably) Think."; an article that urges people to take inequality in to consideration when they cast their vote in political elections (Hoy, 2017, June 6).

- "'Robotic' May Vs 'Principled' Corbyn: The UK's Top 1% Give their Election Verdicts"; an article citing several interviewees who highlighted economic inequality as an issue of concern. (Unknown author, 2017, June 7).

Articles in BBC News

- "Gap Between Rich and Poor Keeps Growing" (Reuben, 2015, May 21).

- "Inequality is bad for growth, says OECD." (Peston, 2015, May 21).

- "Reality Check: Has Inequality Been Getting Worse?" (Unknown author, 2017, January 10).

- "Jeremy Corbyn Outlines Plans to 'Cap' Boardroom Pay" (Unknown author, 2017, January 10).

- "Earnings inequality among men soars." (Bloom, 2017, January 13).

BBC Television Shows / Visual Media

- "Amartya Sen: No Magic Bullet for Inequality" (Sen, 2017, January 16).

- "The Manliest Men in Politics" (Daily Politics, 2017, May 31), discussed research by Price, et al (2017) on attitudes towards inequality and its relationship with physical formidability.

Articles in the Telegraph

- "Inequality is ruining Britain - so why aren't we talking about it more?" (Proud, 2015, May 4).

- "Income Inequality Mapped: London's Boroughs Dominate in the League Table of Haves Vs Have-Nots." (Scott , 2016, December 20).

- "There are Ways to Tackle Inequality - But are Politicians Brave Enough?" (Wright, 2017, May 9).

  Grenfall Tower Articles

- "Look at Grenfell Tower and see The Terrible Price of Britain's Inequality." (Hanley, 2017, June 16).

- "London Fire: A Tale of Two Tower Blocks." (Bell, 2017, June 16).

- "Grenfell Tower residents say managers 'brushed away' fire safety concerns." (Booth & Wahlquist, 2017, June 14).

8.2. Appendix B – Study 1 Ethical Approval Letter

College of Health and Life Sciences Research Ethics Committee (DLS)
Brunel University London
Kingston Lane
Uxbridge
UB8 3PH
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www.brunel.ac.uk

Brunel University London

14 October 2016

LETTER OF APPROVAL

Applicant: Miss Jaye McLaughlin

Project Title: Inequality as a predictor of the incidence of crime

Reference: 3833-LR-Oct/2016- 4148-1

Dear Miss Jaye McLaughlin

The Research Ethics Committee has considered the above application recently submitted by you.

The Chair, acting under delegated authority has agreed that there is no objection on ethical grounds to the proposed study. Approval is given on the understanding that the conditions of approval set out below are followed:

- The agreed protocol must be followed. Any changes to the protocol will require prior approval from the Committee by way of an application for an amendment.

Please note that:

- Research Participant Information Sheets and (where relevant) flyers, posters, and consent forms should include a clear statement that research ethics approval has been obtained from the relevant Research Ethics Committee.
- The Research Participant Information Sheets should include a clear statement that queries should be directed, in the first instance, to the Supervisor (where relevant), or the researcher. Complaints, on the other hand, should be directed, in the first instance, to the Chair of the relevant Research Ethics Committee.
- Approval to proceed with the study is granted subject to receipt by the Committee of satisfactory responses to any conditions that may appear above, in addition to any subsequent changes to the protocol.
- The Research Ethics Committee reserves the right to sample and review documentation, including raw data, relevant to the studyYou may not undertake any research activity if you are not a registered student of Brunel University or if you cease to become registered, including abeyance or temporary withdrawal. As a deregistered student you would not be insured to undertake research activity. Research activity includes the recruitment of participants, undertaking consent procedures and collection of data. Breach of this requirement constitutes research misconduct and is a disciplinary offence.

Professor Christina Victor

Chair

College of Health and Life Sciences Research Ethics Committee (DLS)
Brunel University London

8.3. Appendix C – Interpersonal Aggression Measure

The following measure of interpersonal aggression by Griskevicius et al (2009) was used in

Studies 2, 3, and 4:

Imagine you're at a party and a man/woman you know from one of your classes carelessly

spills a drink on you and does not apologize. In this situation, how much would you want to

engage in these behaviours:

1) Spread negative information that you've heard   Not at All 1 2 3 4 5 6 7 8 9 Very Much
   about this person

2) Tell a friend an embarrassing secret you've heard   Not at All 1 2 3 4 5 6 7 8 9 Very Much
   about this person

   Not at All 1 2 3 4 5 6 7 8 9 Very Much
3) Try to exclude this person from a social group

4) Mention something bad you've heard about this   Not at All 1 2 3 4 5 6 7 8 9 Very Much
   person to other people who know him

   Not at All 1 2 3 4 5 6 7 8 9 Very Much
5) Insult this person to his face

   Not at All 1 2 3 4 5 6 7 8 9 Very Much
6) Push this person

   Not at All 1 2 3 4 5 6 7 8 9 Very Much
7) Get in this person's face

   Not at All 1 2 3 4 5 6 7 8 9 Very Much
8) Hit this person

8.4. Appendix D – CFC: Consideration of Future Consequences Questionnaire

The following questionnaire (Strathman et al, 1994) was used to measure the extent to which participants consider future consequences in Studies 2, 3, and 4:

For each of the statements below, please indicate whether or not the statement is characteristic of you. If the statement is extremely uncharacteristic of you (not at all like you) please select "1"; if the statement is extremely characteristic of you (very much like you) please select "5". And, of course, use the numbers in the middle if you fall between the extremes. Please keep the following scale in mind as you rate each of the 12 statements below.

	1=extremely uncharacteristic	2=somewhat uncharacteristic	3=uncertain	4=somewhat characteristic	5=extremely characteristic
1. I consider how things might be in the future, and try to influence those things with my day to day behavior.					
2. Often I engage in a particular behavior in order to achieve outcomes that may not result for many years.					
3. I only act to satisfy immediate concerns, figuring the future will take care of itself.					
4. My behavior is only influenced by the immediate (i.e., a matter of days or weeks) outcomes of my actions.					
5. My convenience is a big factor in the decisions I make or the actions I take.					
6. I am willing to sacrifice my immediate happiness or well-being in order to achieve future outcomes.					
7. I think it is important to take warnings about negative outcomes seriously even if the negative outcome will not occur for many years.					
8. I think it is more important to perform a behavior with important distant consequences than a behavior with less-important immediate consequences.					
9. I generally ignore warnings about possible future problems because I think the problems will be resolved before they reach crisis level.					
10. I think that sacrificing now is usually unnecessary since future outcomes can be dealt with at a later time.					
11. I only act to satisfy immediate concerns, figuring that I will take care of future problems that may occur at a later date.					
12. Since my day to day work has specific outcomes, it is more important to me than behavior that has distant outcomes.					

8.5. Appendix E – Study 2 Ethical Approval Letter

Brunel University London

23 November 2017

LETTER OF APPROVAL

Applicant: Dr Nicholas Pound

Project Title: Economic Views & Lifestyle Choices

Reference: 7657-LR-Nov/2017- 8803-1

Dear Dr Nicholas Pound

The Research Ethics Committee has considered the above application recently submitted by you.

The Chair, acting under delegated authority has agreed that there is no objection on ethical grounds to the proposed study. Approval is given on the understanding that the conditions of approval set out below are followed:

- A18 - two minor errors - Firstly can you put the date of approval on the advert after the line of information to say it has been reviewed by CHLS REC, and secondly just a small typo error on the PIS under 'What are the possible disadvantages and risks of taking part?' The first word should be 'there'

- The agreed protocol must be followed. Any changes to the protocol will require prior approval from the Committee by way of an application for an amendment.

Please note that:

- Research Participant Information Sheets and (where relevant) flyers, posters, and consent forms should include a clear statement that research ethics approval has been obtained from the relevant Research Ethics Committee.
- The Research Participant Information Sheets should include a clear statement that queries should be directed, in the first instance, to the Supervisor (where relevant), or the researcher. Complaints, on the other hand, should be directed, in the first instance, to the Chair of the relevant Research Ethics Committee.
- Approval to proceed with the study is granted subject to receipt by the Committee of satisfactory responses to any conditions that may appear above, in addition to any subsequent changes to the protocol.
- The Research Ethics Committee reserves the right to sample and review documentation, including raw data, relevant to the study.

Professor Christina Victor

Chair

College of Health and Life Sciences Research Ethics Committee (DLS)
Brunel University London

8.6. Appendix F – PRDS-R: Personal Relative Deprivation Scale - Revised

The following measure of perceptions of personal relative deprivation (Callan et al, 2008;

Callan et al, 2011) was used in Studies 3 and 4:

Please indicate the degree to which you agree with the following statements.

	Strongly Disagree	Moderately Disagree	Slightly Disagree	Slightly Agree	Moderately Agree	Strongly Agree
1. I feel deprived when I think about what I have compared to what other people like me have	O	O	O	O	O	O
2. I feel privileged compared to other people like me	O	O	O	O	O	O
3. I feel resentful when I see how prosperous other people like me seem to be	O	O	O	O	O	O
4. When I compare what I have with what others like me have, I realize that I am quite well off	O	O	O	O	O	O
5. I feel dissatisfied with what I have compared to what other people like me have	O	O	O	O	O	O

8.7. Appendix G – ERS: Evolutionary Risk Scale

The following questionnaire (Wilke et al, 2014) was used to measure risk-taking across

different evolutionary life domains in Study 3:

For each of the following statements, please indicate the likelihood that you would engage
in the described activity or behaviour if you were to find yourself in that situation. Provide a
rating from extremely unlikely to extremely likely, using the following scale:

	Very Unlikely	Unlikely	Not Sure	Likely	Very Likely
Sitting in the section for fans of the opposing team with a group of friends while wearing your team's colours.	O	O	O	O	O
Adamantly defending the honour of your local team against a fan from a different sporting team, even if it may cause a fight.	O	O	O	O	O
Starting a rivalry with students from another school in one of your extracurricular activities.	O	O	O	O	O
Trying to take a leadership role in any peer group you join.	O	O	O	O	O
Arguing with members of a group project over what should be done.	O	O	O	O	O
Attempting to influence people in your social group to advance your own agenda.	O	O	O	O	O
Blackmailing your opponent to win an election.	O	O	O	O	O
Carrying around a weapon to appear strong and in control to your peers.	O	O	O	O	O
Telling lies to the leader about a teammate to appear more trustworthy than the other person (i.e., to get ahead).	O	O	O	O	O
Swimming far out from shore to reach a diving platform.	O	O	O	O	O
Hiking on a mountain trail with a beautiful view but with a high chance of a landslide.	O	O	O	O	O
Going on an expedition into the desert where there will be no one else around.	O	O	O	O	O
Planting your own garden to grow your own fruits and vegetables.	O	O	O	O	O

Only eating meat from a local farm that does not use hormone injections or any unnatural processes.	O	O	O	O	O
Significantly increasing your weekly food bill to buy healthy organic food.	O	O	O	O	O
Not boiling or filtering water from a questionable source before drinking it.	O	O	O	O	O
Eating at a restaurant where your friend got food poisoning.	O	O	O	O	O
Eating a piece of food that has fallen on the floor.	O	O	O	O	O
Talking your parents into giving you weekly allowance money.	O	O	O	O	O
Bugging your parents for money to go out with friends until they finally give in.	O	O	O	O	O
Asking your parents to get their old car when they get a new one (instead of giving it to your siblings).	O	O	O	O	O
Risking your life to drag your parents from a burning building.	O	O	O	O	O
Staying up all night to help your sibling with a difficult school project.	O	O	O	O	O
Donating a kidney to your sibling.	O	O	O	O	O
Taking part in sexual acts that you may not usually do to look more sexually appealing to the opposite sex.	O	O	O	O	O
Casually dating more than one person at a time.	O	O	O	O	O
Having a consistent sexual partner with whom you are not romantically involved.	O	O	O	O	O
Not putting in the effort to fulfill the requests of your significant other, such as remembering to call them when they ask you to.	O	O	O	O	O
Dumping the person you have been seeing when they mention commitment.	O	O	O	O	O
Spending the night with an attractive person while vacationing without your significant other.	O	O	O	O	O

8.8. Appendix H – EIS: Eysenck Impulsivity Scale

The following impulsivity subscale from the Eysenck Impulsiveness, Venturesomeness, and

Empathy Inventory (Eysenck et al, 1985) from the was used to measure impulsivity in

Studies 3 and 4:

Please answer each question by choosing either 'YES' or the 'NO' for the following the questions. There are no right or wrong answers, and no trick questions. Work quickly and do not think too long about the exact meaning of the question.

	Yes	No
Do you often buy things on impulse?	O	O
Do you generally do and say things without stopping to think?	O	O
Do you often get into a jam because you do things without thinking?	O	O
Are you an impulsive person?	O	O
Do you usually think carefully before doing anything?	O	O
Do you often do things on the spur of the moment?	O	O
Do you mostly speak before thinking things out?	O	O
Do you often get involved in things you later wish you could get out of?	O	O
Do you get so 'carried away' by new and exciting ideas, that you never think of possible snags?	O	O
Do you need to use a lot of self-control to keep out of trouble?	O	O
Would you agree that almost everything enjoyable is illegal or immoral?	O	O
Are you often surprised at people's reactions to what you do or say?	O	O
Do you think an evening out is more successful if it is unplanned or arranged at the last moment?	O	O
Do you usually work quickly, without bothering to check?	O	O
Do you often change your interests?	O	O
Before making up your mind, do you consider all the advantages and disadvantages?	O	O
Do you prefer to 'sleep on it' before making decisions?	O	O
When people shout at you. do you shout back?	O	O
Do you usually make up your mind quickly?	O	O

8.9. Appendix I – Study 3 Ethical Approval Letter

College of Health and Life Sciences Research Ethics Committee (DLS)
Brunel University London
Kingston Lane
Uxbridge
UB8 3PH
United Kingdom

www.brunel.ac.uk

23 May 2018

LETTER OF APPROVAL

Applicant: Ms Jaye McLaughlin

Project Title: Economic Views & Behavioural Choices

Reference: 7541-LR-May/2018- 12745-1

Dear Ms Jaye McLaughlin

The Research Ethics Committee has considered the above application recently submitted by you.

The Chair, acting under delegated authority has agreed that there is no objection on ethical grounds to the proposed study. Approval is given on the understanding that the conditions of approval set out below are followed:

- A18 - PIS - You may want to consider making your statement about withdrawing in the section 'Do I have to take part?' clearer. If your survey is anonymous how will you be able to withdraw their data at a later date if they choose - your currently state '... you are still free to withdraw at any time' do you mean up to submission of the survey only?

- A18 - Debrief - Minor error in the second paragraph, please ensure all font is the same colour.

- Advert - Following your statement regarding college research ethics committee approval please add both the date of approval and the expiry date (your end date).

- The agreed protocol must be followed. Any changes to the protocol will require prior approval from the Committee by way of an application for an amendment.

Please note that:

- Research Participant Information Sheets and (where relevant) flyers, posters, and consent forms should include a clear statement that research ethics approval has been obtained from the relevant Research Ethics Committee.
- The Research Participant Information Sheets should include a clear statement that queries should be directed, in the first instance, to the Supervisor (where relevant), or the researcher. Complaints, on the other hand, should be directed, in the first instance, to the Chair of the relevant Research Ethics Committee.
- The Research Ethics Committee reserves the right to sample and review documentation, including raw data, relevant to the study.
- You may not undertake any research activity if you are not a registered student of Brunel University or if you cease to become registered, including abeyance or temporary withdrawal. As a deregistered student you would not be insured to undertake research activity. Research activity includes the recruitment of participants, undertaking consent procedures and collection of data. Breach of this requirement constitutes research misconduct and is a disciplinary offence.

Professor Christina Victor

Chair

College of Health and Life Sciences Research Ethics Committee (DLS)

8.10. Appendix J – Study 3 Full Bivariate Associations

Table 8.1

(Part 1 of 3) Study 3. Full Report of Bivariate Associations Between Inequality and Risk Factors for Violence

Measure	1.PRD r p	2. r p	3. r p	4. r p	5. r p	6. r p	7. r p	8. r p	9. r p	10. r p	11. r p
2. CFC	-.265 *<.001*	-	-	-	-	-	-	-	-	-	-
3. Impulsivity	.142 *.011*	-.396 *<.001*	-	-	-	-	-	-	-	-	-
4. Between group competition (ERS)	.089 *.111*	.191 *.001*	.334 *<.001*	-	-	-	-	-	-	-	-
5. Within group competition (ERS)	.009 *.880*	.119 *.033*	.139 *.013*	.358 *<.001*	-	-	-	-	-	-	-
6. Status/power (ERS)	.234 *<.001*	-.226 *<.001*	.292 *<.001*	.459 *<.001*	.339 *<.001*	-	-	-	-	-	-
7. Environmental exploration (ERS)	<.001 *.999*	-.030 *.592*	.153 *.006*	.342 *<.001*	.289 *<.001*	.262 *<.001*	-	-	-	-	-
8. Food selection (ERS)	-.161 *.004*	.151 *.007*	-.113 *.044*	-.022 *.702*	.121 *.032*	.044 *.431*	.146 *.009*	-	-	-	-
9. Food acquisition (ERS)	.054 *.336*	-.110 *.051*	.190 *.001*	.187 *.001*	.222 *<.001*	.249 *<.001*	.276 *<.001*	.027 *.638*	-	-	-
10. Parent-offspring conflict (ERS)	.064 *.254*	-.112 *.046*	.235 *<.001*	.317 *<.001*	.309 *<.001*	.383 *<.001*	.115 *.040*	.033 *.553*	.166 *.003*	-	-
11. Kinship (ERS)	-.064 *.254*	.089 *.113*	<.001 *.994*	.054 *.335*	.088 *.119*	-.041 *.466*	.079 *.158*	.158 *.005*	-.120 *.032*	.036 *.527*	-
12. Mate attraction (ERS)	-.175 *.002*	-.162 *.004*	.299 *<.001*	.370 *<.001*	.400 *<.001*	.366 *<.001*	.243 *<.001*	-.019 *.733*	.243 *<.001*	.308 *<.001*	-.089 *.113*
13. Mate retention (ERS)	.167 *.003*	-.212 *<.001*	.261 *<.001*	.376 *<.001*	.233 *<.001*	.492 *<.001*	.225 *<.001*	-.050 *.374*	.253 *<.001*	.299 *<.001*	-.214 *<.001*
14. Overall aggression	.177 *.002*	-.171 *.002*	.223 *<.001*	.314 *<.001*	.254 *<.001*	.414 *<.001*	.127 *.024*	-.055 *.328*	.189 *.001*	.166 *.003*	-.134 *.017*

Table 8.2

(Part 2 of 3) Full Study 3 Bivariate Correlations continued…

Measure	1. r/r_s p	2. r/r_s p	3. r/r_s p	4. r/r_s p	5. r/r_s p	6. r/r_s p	7. r/r_s p	8. r/r_s p	9. r/r_s p	10. r/r_s p	11. r/r_s p
15. Direct Aggression	.113 *.044*	-.157 *.005*	.281 *<.001*	.366 *<.001*	.244 *<.001*	.381 *<.001*	.157 *.005*	-.081 *.152*	.197 *<.001*	.125 *.026*	-.110 *.050*
16. Indirect Aggression	.189 *.001*	-.157 *.005*	.162 *.004*	.274 *<.001*	.233 *<.001*	.385 *<.001*	.110 *.051*	-.032 *.564*	.156 *.005*	.173 *.002*	-.126 *.024*
17. Perceived personal position (ISSP)	-.438 *<.001*	.203 *<.001*	-.145 *.010*	.009 *.876*	.157 *.005*	.040 *.482*	.063 *.263*	.086 *.128*	.011 *.841*	.080 *.157*	-.091 *.106*
18. Perceived family position (ISSP)	-.250 *<.001*	.177 *.002*	-.148 *.008*	.075 *.180*	.074 *.190*	.061 *.277*	.093 *.098*	.100 *.075*	.012 *.824*	.084 *.136*	-.033 *.562*
19. Income relative to others in UK (AB)	-.368 *<.001*	.075 *.180*	.050 *.375*	.072 *.203*	.135 *.016*	.036 *.521*	-.013 *.811*	.025 *.659*	.036 *.520*	.125 *.025*	-.034 *.541*
20. Living conditions relative to others in UK (AB)	-.376 *<.001*	.089 *.112*	-.039 *.493*	.079 *.159*	.135 *.016*	.034 *.543*	.059 *.294*	.063 *.261*	.115 *.040*	.114 *.043*	-.035 *.533*
21. Income relative to others in neighbourhood (AB)	-.340 *<.001*	.030 *.596*	.008 *.881*	.115 *.041*	.067 *.236*	-.009 *.868*	.049 *.382*	.038 *.494*	.041 *.462*	.080 *.154*	.046 *.412*
22. Living conditions relative to neighbourhood (AB)	-.289 *<.001*	.127 *.024*	-.080 *.153*	.064 *.254*	.030 *.594*	-.064 *.257*	.083 *.139*	.025 *.660*	.070 *.213*	-.001 *.984*	.104 *.065*

Table 8.3

(Part 3 of 3) Full Study 3 Bivariate Correlations continued…

Measure	12.	13.	14.	15.	16.	17.	18.	19.	20.	21.
	r	*r*	*r*	*r*	*r*	r_s	r_s	r_s	r_s	r_s
	p	*p*	*p*	*p*	*p*	*p*	*p*	*p*	*p*	*p*
13. Mate retention (ERS)	.565 *<.001*	-	-	-	-	-	-	-	-	-
14. Overall Aggression	.297 *<.001*	.334 *<.001*	-	-	-	-	-	-	-	-
15. Direct Aggression	.286 *<.001*	.299 *<.001*	.877 *<.001*	-	-	-	-	-	-	-
16. Indirect Aggression	.263 *<.001*	.317 *<.001*	.949 *<.001*	.710 *<.001*	-	-	-	-	-	-
17. Perceived personal position (ISSP)	-.033 *.554*	.024 *.675*	.125 *.026*	.123 *.029*	.113 *.045*	-	-	-	-	-
18. Perceived family position (ISSP)	-.003 *.960*	.038 *.504*	.094 *.096*	.129 *.022*	.067 *.231*	.625 *<.001*	-	-	-	-
19. Income relative to others in UK (AB)	.051 *.366*	.042 *.460*	.090 *.111*	.086 *.124*	.081 *.147*	.564 *<.001*	.307 *<.001*	-	-	-
20. Living conditions relative to others in UK (AB)	-.018 *.746*	.104 *.064*	.118 *.035*	.076 *.175*	.117 *.037*	.532 *<.001*	.291 *<.001*	.496 *<.001*	-	-
21. Income relative to others in neighbourhood (AB)	-.016 *.770*	.001 *.983*	.043 *.444*	.057 *.311*	.016 *.770*	.401 *<.001*	.232 *<.001*	.531 *<.001*	.267 *<.001*	-
22. Living conditions relative to neighbourhood (AB)	-.144 *.010*	-.087 *.120*	.026 *.647*	.003 *.954*	.005 *.929*	.322 *<.001*	.265 *<.001*	.264 *<.001*	.430 *<.001*	.516 *<.001*

Note. Values for items 17 – 22 show Spearman's rho; all remaining value are Pearson's correlation. "ERS" – Evolutionary risk scale; "ISSP" – International Social Survey Program; "AB" – Afrobarometer.

8.11. Appendix K – Study 3 Further Association Between PRD Scores and Risk-Taking Scores

Figure 8.1

Study 3 Association Between PRD Scores and Risk-Taking Scores in The Mate Attraction Domain
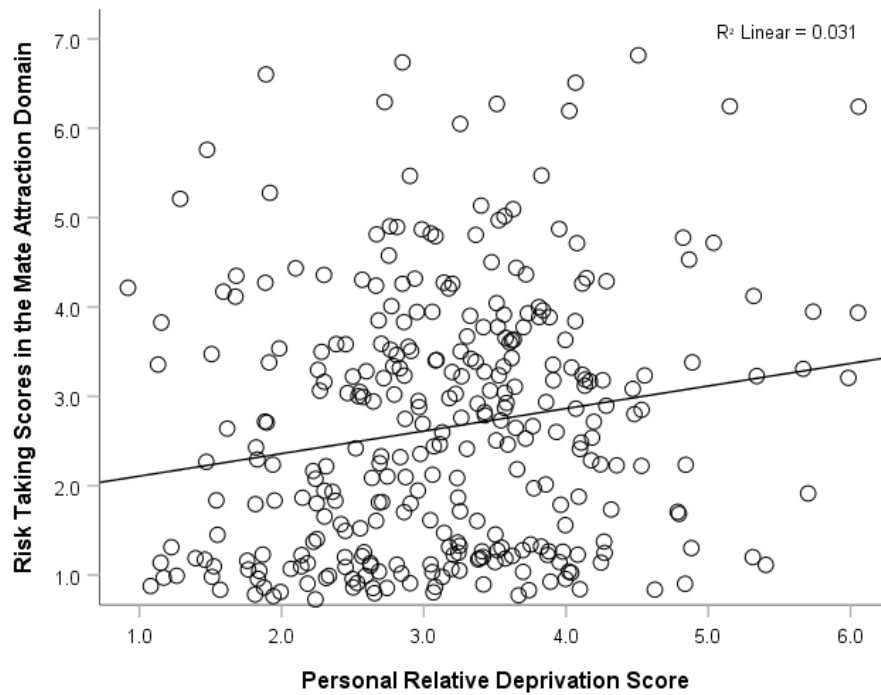
Note. Personal Relative Deprivation (PRD) scores were positively associated with risk taking scores in the mate attraction domain, *r* = -.161, *p* = .004. Graph includes jitter to reveal overlapping scores.

Figure 8.2

Study 3 Association Between PRD Scores and Risk-Taking Scores in The Food Selection Domain
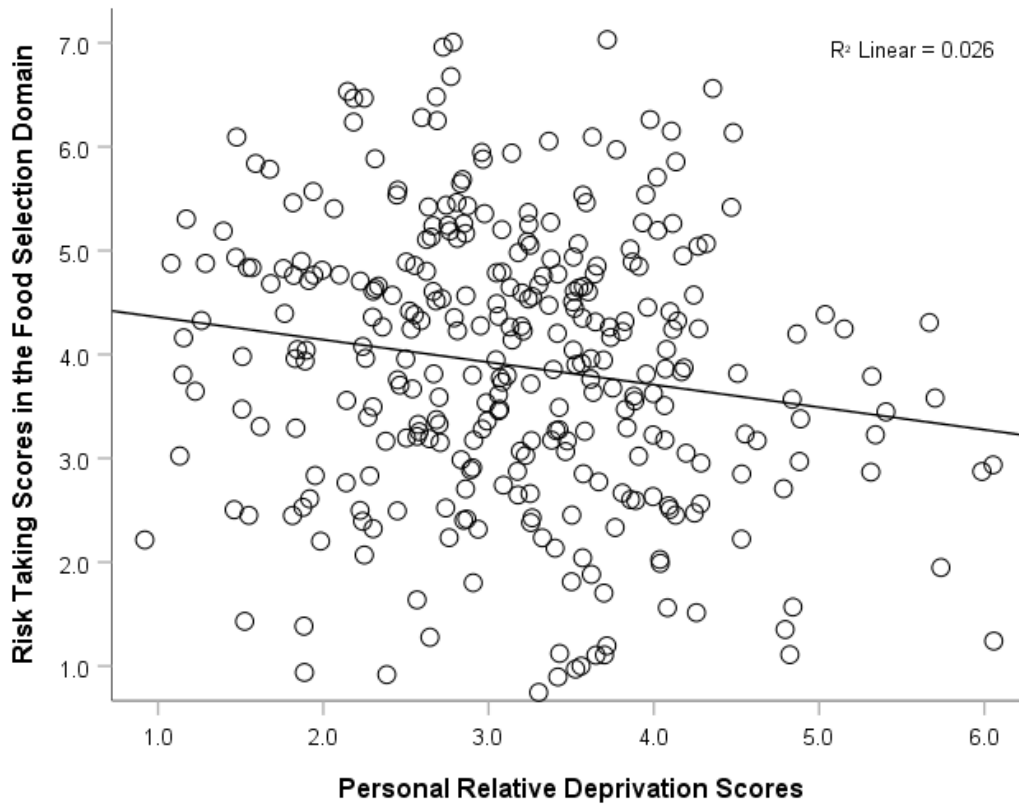
Note. Personal Relative Deprivation (PRD) scores were negatively associated with risk taking scores in the food selection domain, $r = .175$, $p = .002$. Graph includes jitter to reveal overlapping scores.

8.12. Appendix L – Study 3 Associations Between PRD and Single Item Measures of Personal Social Position

Figure 8.3

Study 3 Association Between Personal Relative Deprivation Scores and Perceived Current Position in Society
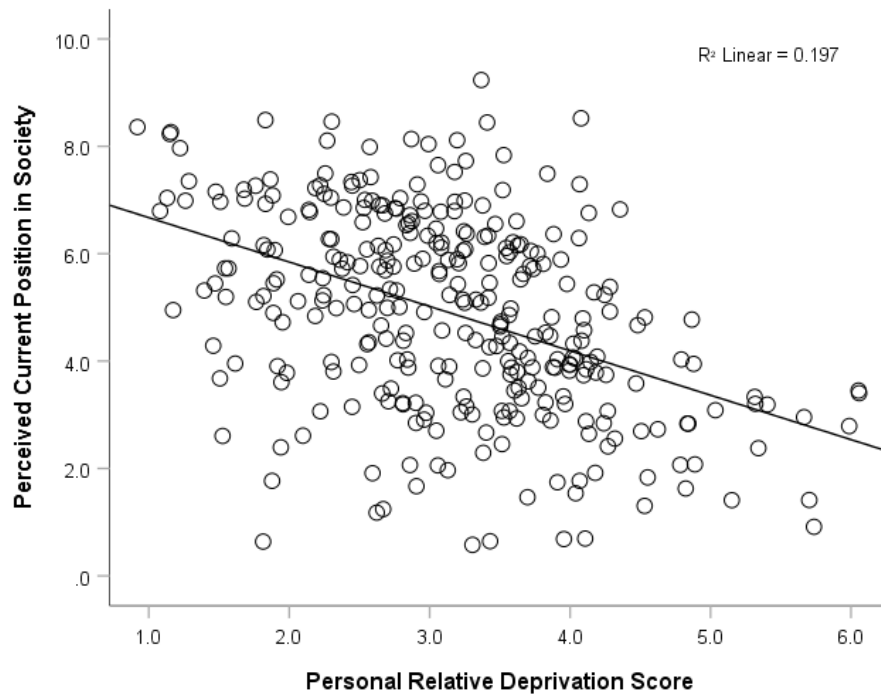
Note. Personal relative deprivation (PRD) scale scores and ratings of personal social position in society were negative associated, r_s = -.438, p < .001. Graph includes jitter to reveal overlapping scores.

Figure 8.4

Study 3 Association Between Personal Relative Deprivation Scores and Perceived Previous Family Position in Society
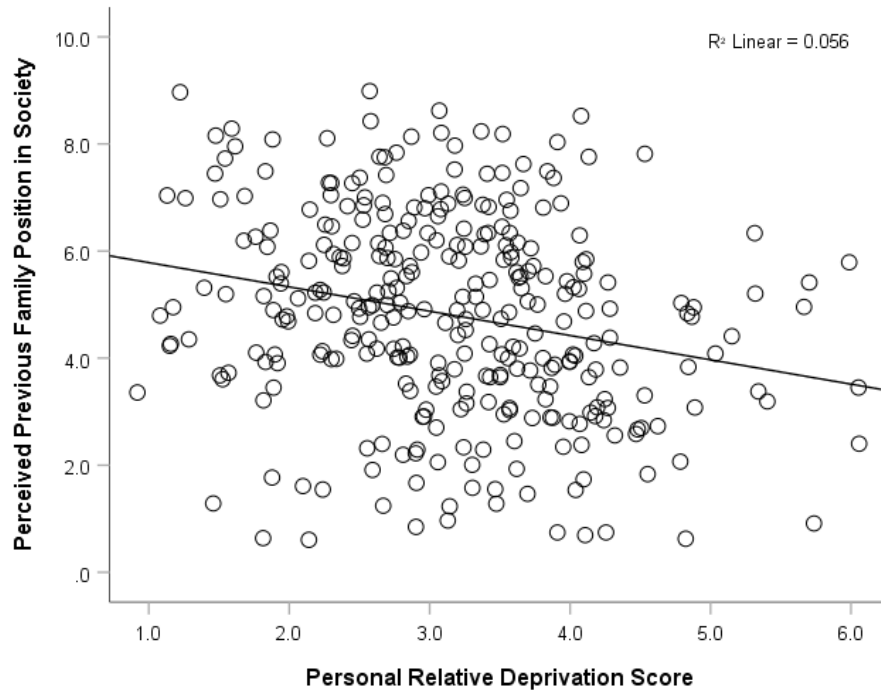
Note. Personal relative deprivation (PRD) scale scores and ratings of previous family social position were negatively associated, r_s = -.250, p < .001. Graph includes jitter to reveal overlapping scores.

Figure 8.5

Study 3 Participants Personal Relative Deprivation Scores According to their Ratings of their Personal Income Relative to Others in the UK
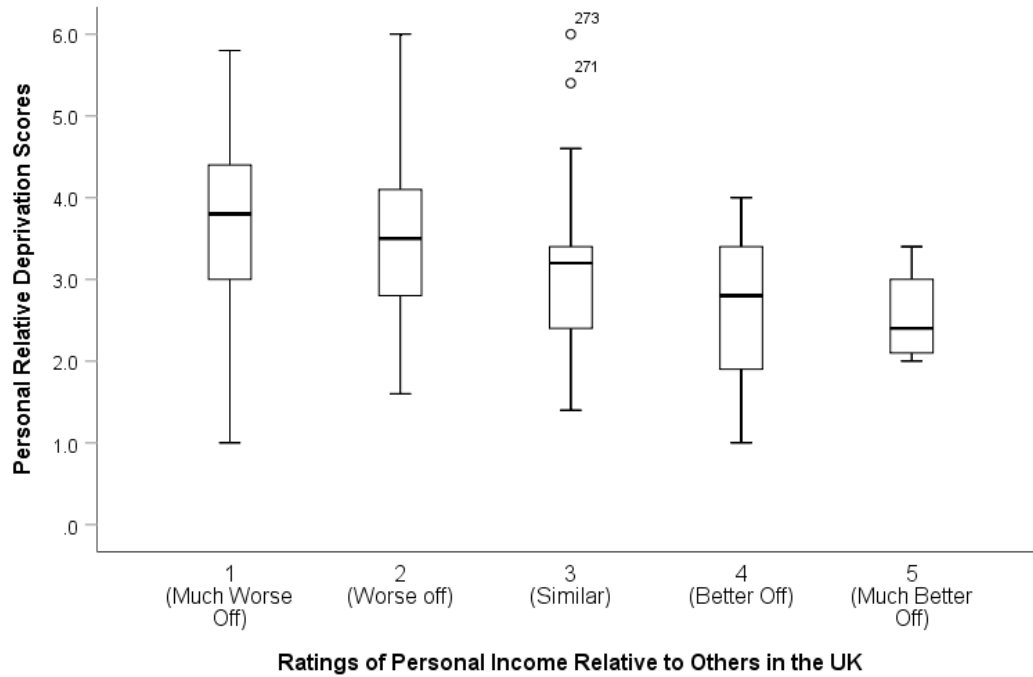
 Note. Participants are grouped according to their answers to the question "In general, how do you rate your income compared to those of other people in the United Kingdom?". Spearman's rho test showed that Personal Relative Deprivation (PRD) scale scores and ratings of income relative to others in the UK were negatively associated, r_s = -.368, p < .001.

Figure 8.6

Study 3 Participants Personal Relative Deprivation Scores According to their Ratings of Personal Income Relative to Others in their Relative Local Neighbourhoods
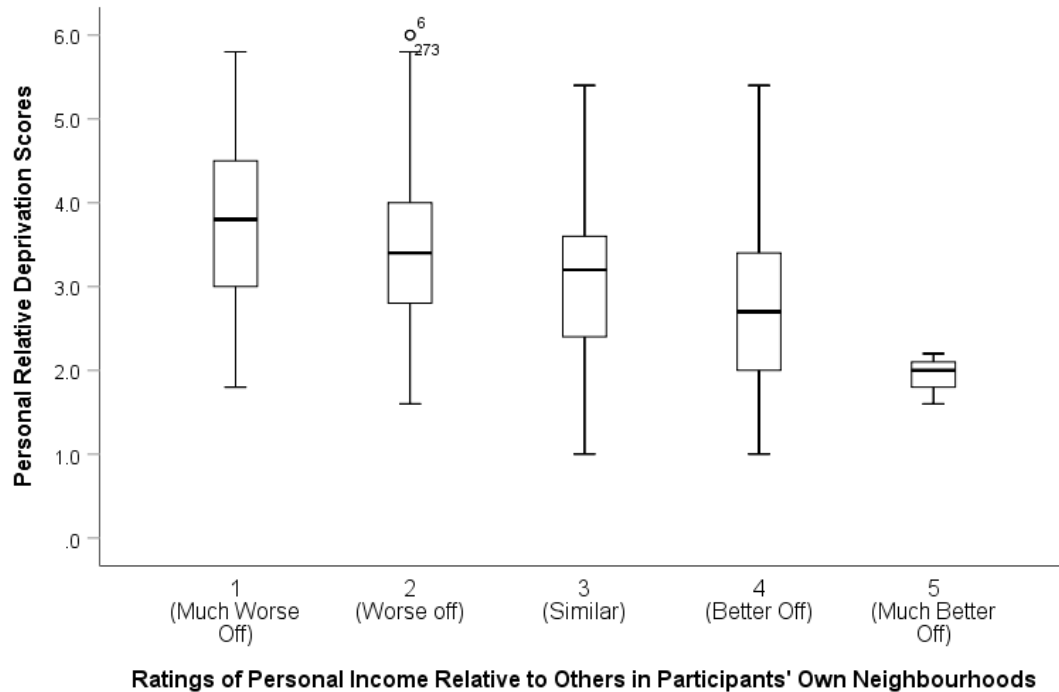
Note. Participants are grouped according to their answers to the question "In general, how do you rate your income compared to those of other people in your local area / neighbourhood?". Spearman's rho test showed that Personal Relative Deprivation (PRD) scale scores and self-ratings of income relative to others in participants' neighbourhoods were negatively associated, $r_s = -.340$, $p < .001$.

Figure 8.7

Study 3 Participants Personal Relative Deprivation Scores According to their Ratings of Personal Living Conditions Relative to Others in the UK

Note. Participants are grouped according to their answers to the question "In general, how do you rate your living conditions compared to those of other people in the United Kingdom?". Spearman's rho test showed that Personal Relative Deprivation (PRD) scale scores and self-ratings of personal livings conditions relative to others in the UK were negatively associated, r_s = -.376, $p < .001$.

Figure 8.8

Study 3 Association Between Personal Relative Deprivation Scores and Ratings of Personal Living Conditions Relative to Others in Participants' Relative Neighbourhoods
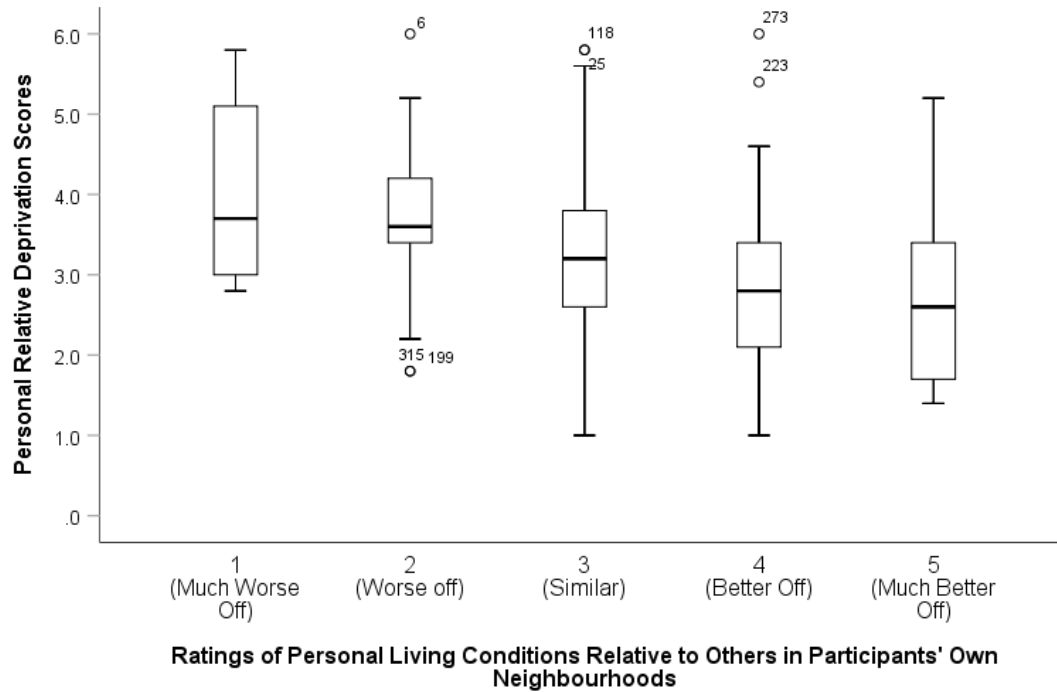
Note. Participants are grouped according to their answers to the question "In general, how do you rate your living conditions compared to those of other people in your local area / neighbourhood?" Spearman's rho test showed that Personal Relative Deprivation (PRD) scale scores were negatively associated with participants' self-ratings of their personal living conditions relative to others in their neighbourhoods, r_s = -.289, p < .001.

8.1. Appendix M – Study 3 Further Associations with Aggression

Figure 8.9

Study 3 Association Between Overall Interpersonal Aggression Scores and Risk-Taking Scores in the Environmental Exploration Domain
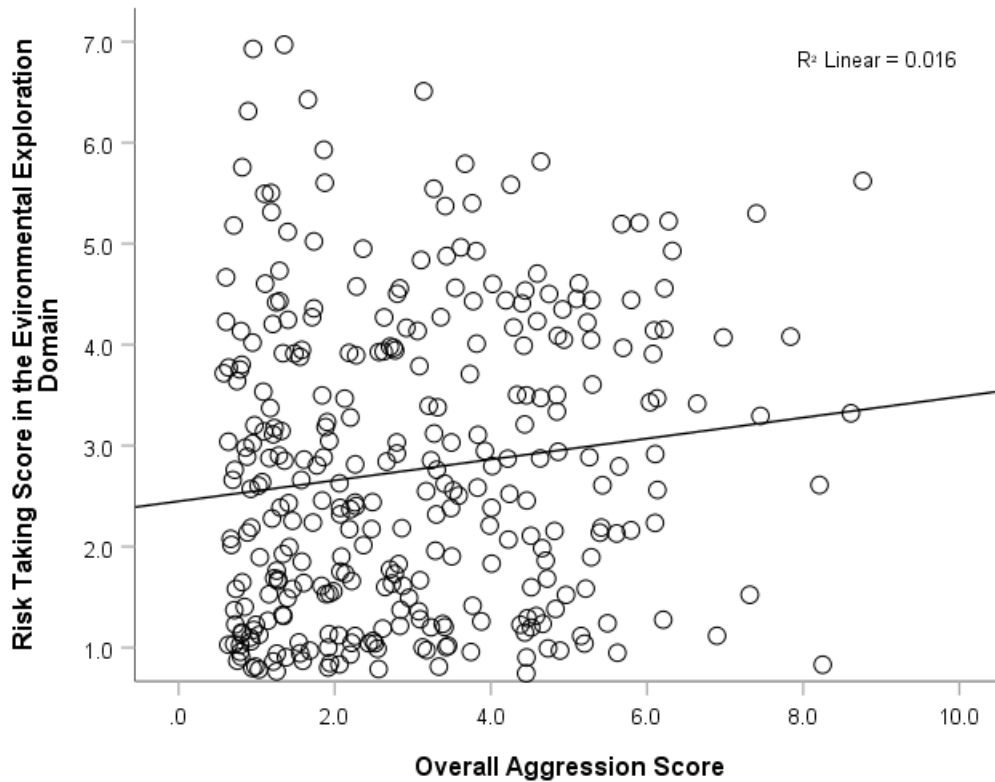
Note. Overall aggression scores were positively associated with risk-taking scores in the environmental exploration domain, r = .127, p = .024. Graph includes jitter to reveal overlapping scores.

Figure 8.10

Study 3 Association Between Overall Interpersonal Aggression Scores and Risk-Taking Scores in the Food Acquisition Domain
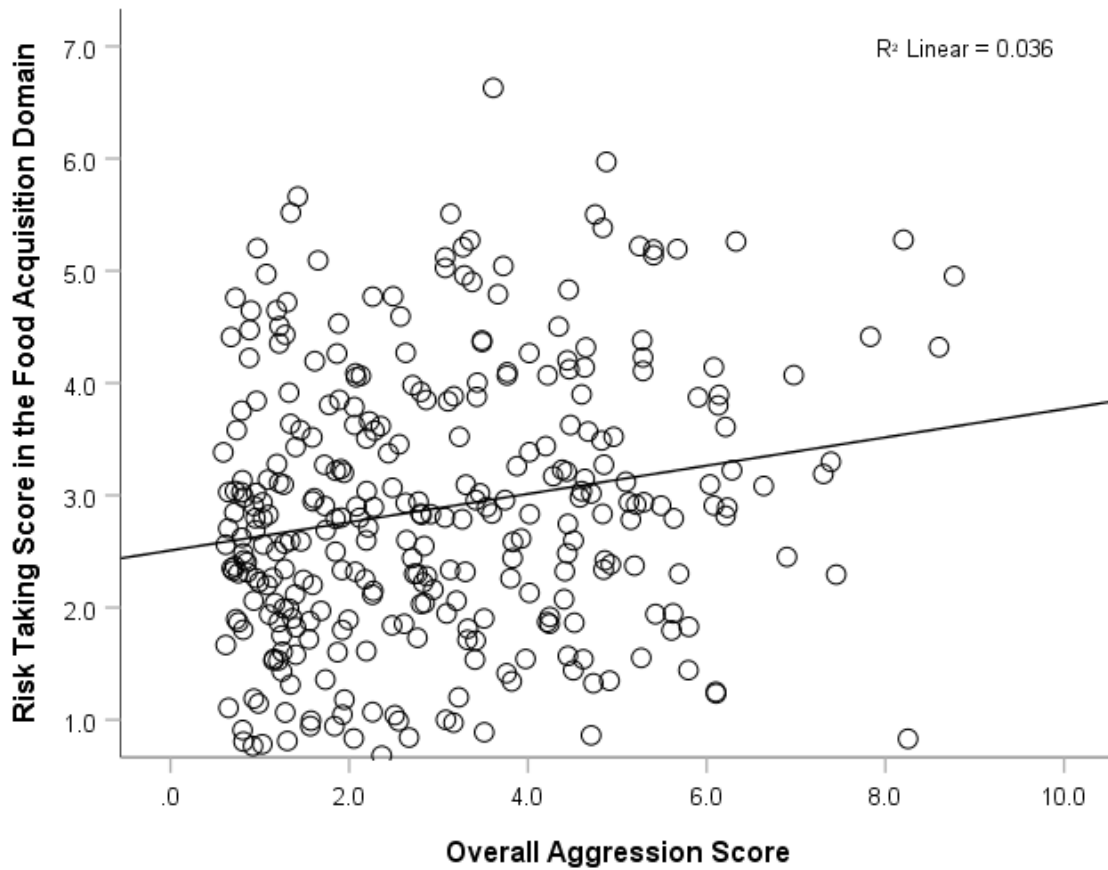
Note. Overall aggression scores were positively associated with risk-taking scores in the food acquisition domain, r = .189, p = .001. Graph includes jitter to reveal overlapping scores.

Figure 8.11

Study 3 Association Between Overall Interpersonal Aggression Scores and Risk-Taking Scores in the Parent Offspring Conflict Domain
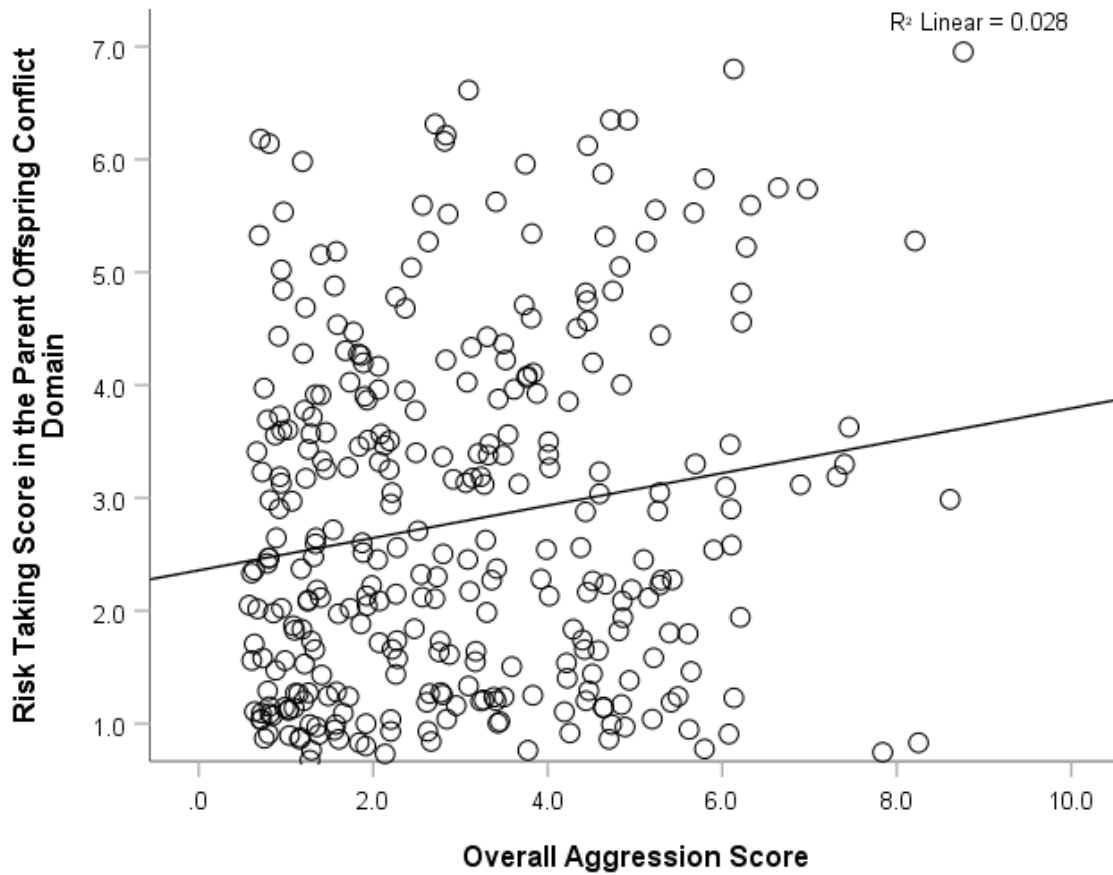
Note. Overall aggression scores were positively associated with risk-taking scores in the parent offspring conflict domain, $r = .166$, $p = .003$. Graph includes jitter to reveal overlapping scores.

Figure 8.12

Study 3 Association Between Overall Interpersonal Aggression Scores and Risk-Taking Scores in the Mate Attraction Domain
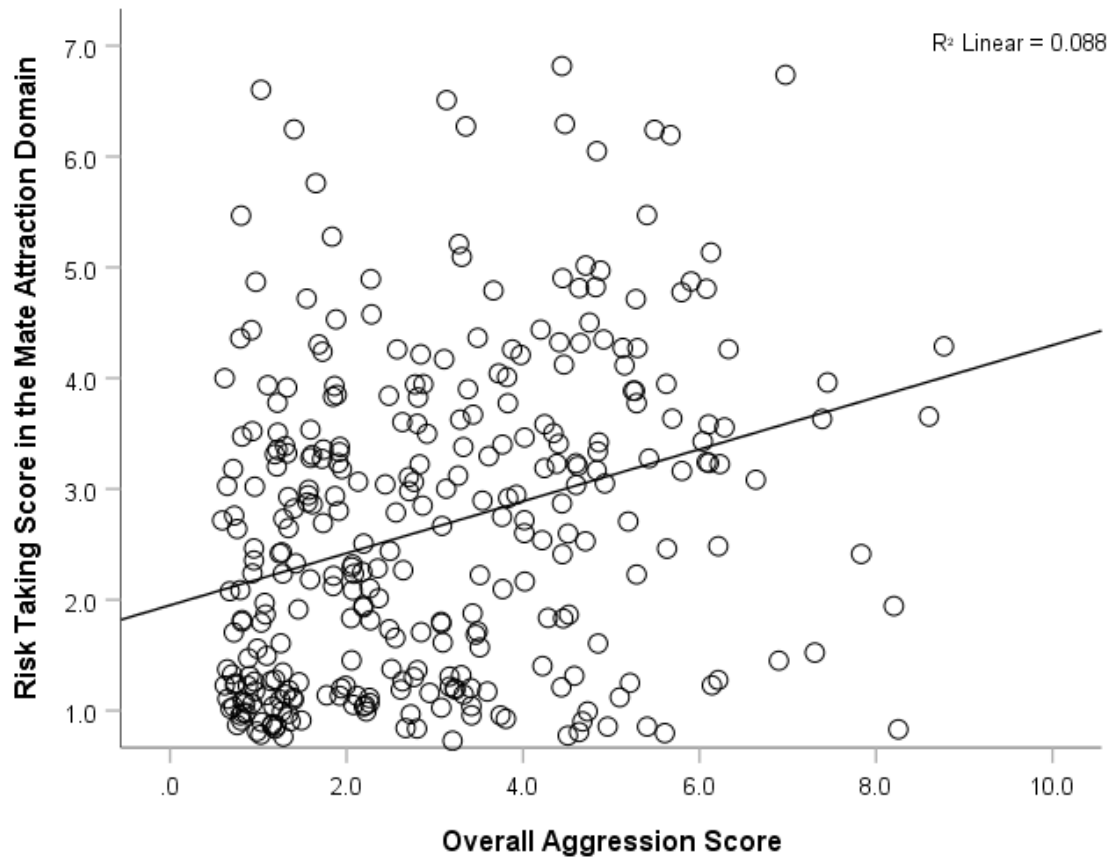
Note. Overall aggression scores were positively associated with risk-taking scores in the mate attraction domain, r = .297, p < .001.

Figure 8.13

Study 3 Association Between Overall Interpersonal Aggression Scores and Risk-Taking Scores in the Mate Retention Domain
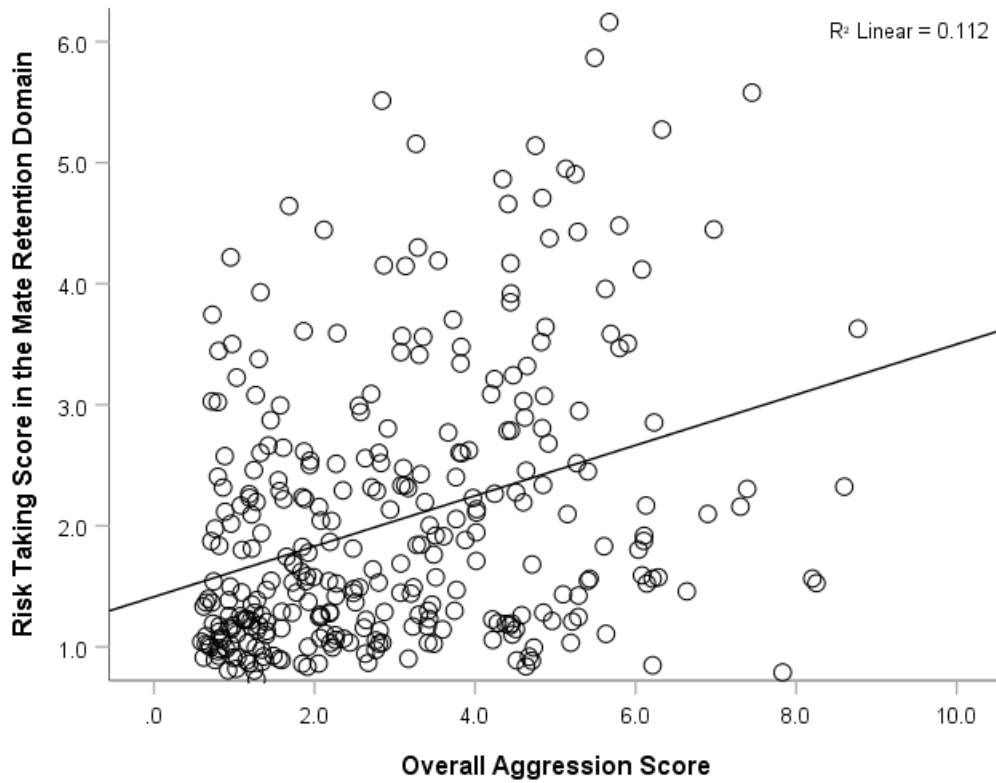
Note. Overall aggression scores were positively associated with risk-taking scores in the mate retention domain, $r = .334$, $p < .001$.

8.2. Appendix N – Study 3 Associations Between Personal Social Position and Risk-Factors for Violence

Figure 8.14

Study 3 Association Between Perceived Current Personal Position in Society and Direct Aggression Scores
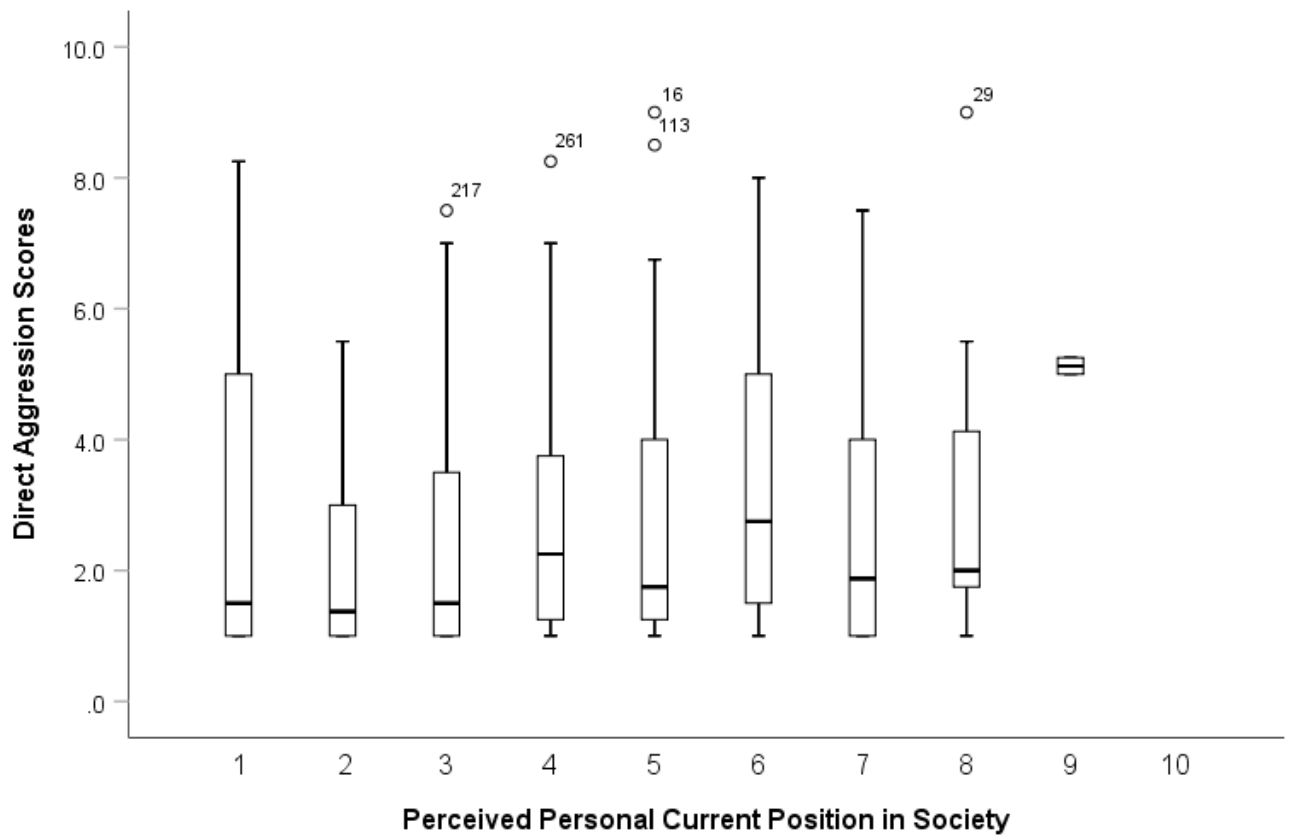
Note. Participants are grouped according to their answer to the question "In our society there are groups which tend to be towards the top and groups which tend to be towards the bottom. Below is a scale that runs from top to bottom. Where would you put yourself now on this scale?". Spearman's rho test showed that perceived current personal position in society was negatively associated with direct aggression scores, r_s = .123, p = .029.

Figure 8.15

Study 3 Association Between Perceived Current Personal Position in Society and Indirect Aggression Scores

Note. Participants are grouped according to their answer to the question "In our society there are groups which tend to be towards the top and groups which tend to be towards the bottom. Below is a scale that runs from top to bottom. Where would you put yourself now on this scale?". Spearman's rho test showed that perceived current personal position in society was negatively associated with indirect aggression scores, r_s = .113, p = .045.

Figure 8.16

Study 3 Association Between Perceived Previous Family Position in Society and Overall Aggression Scores
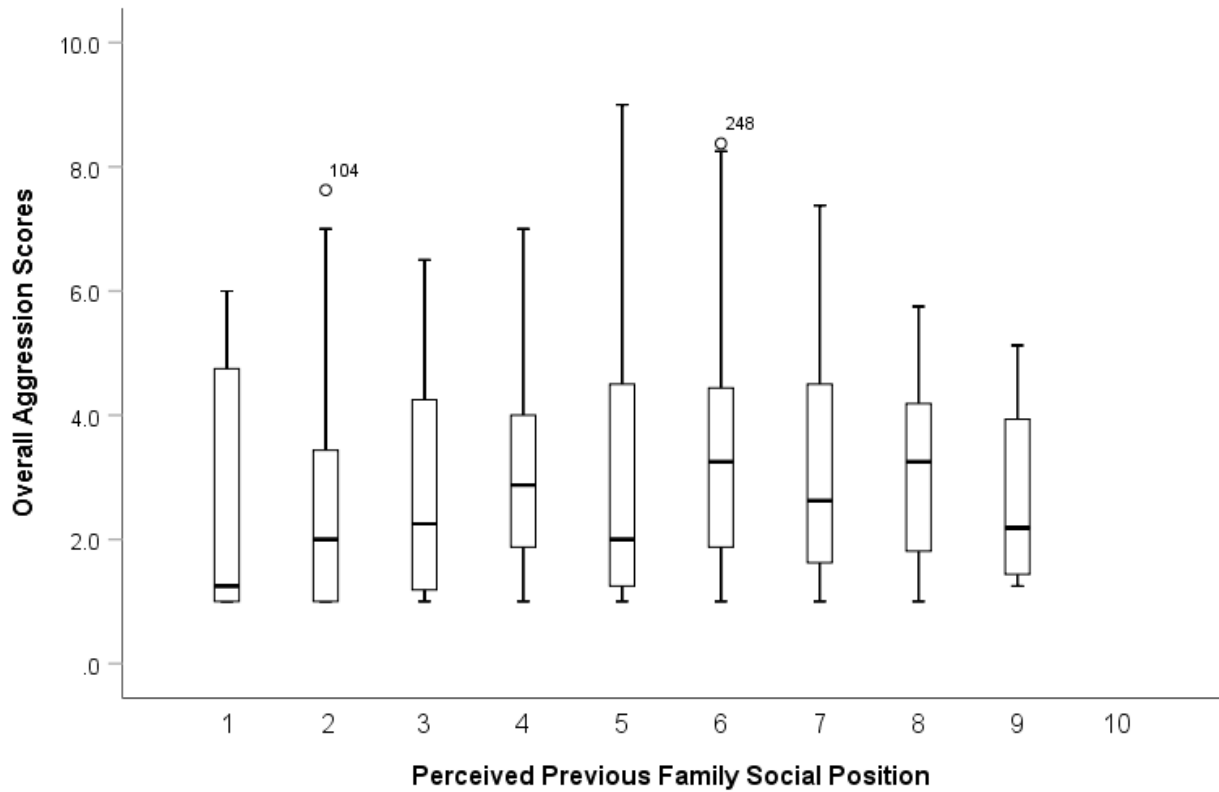
Note. Participants are grouped according to their answer to the question "In our society there are groups which tend to be towards the top and groups which tend to be towards the bottom. Below is a scale that runs from top to bottom....And if you think about the Family you grew up in, where do they fit in?". Spearman's rho test showed that perceived previous family social position in society was not significantly associated with overall aggression scores, r_s = .094, p = .096.

Figure 8.17

Study 3 Association Between Perceived Previous Family Position in Society and Indirect Aggression Scores

Note. Participants are grouped according to their answer to the question "In our society there are groups which tend to be towards the top and groups which tend to be towards the bottom. Below is a scale that runs from top to bottom….And if you think about the Family you grew up in, where do they fit in?". Spearman's rho test showed that perceived previous family social position in society was not significantly associated with indirect aggression scores, r_s = .067, p = .231.

Figure 8.18

Study 3 Association Between Ratings of Personal Income Relative to Others in the UK and Risk-Taking Scores in the Parent Offspring Conflict Domain
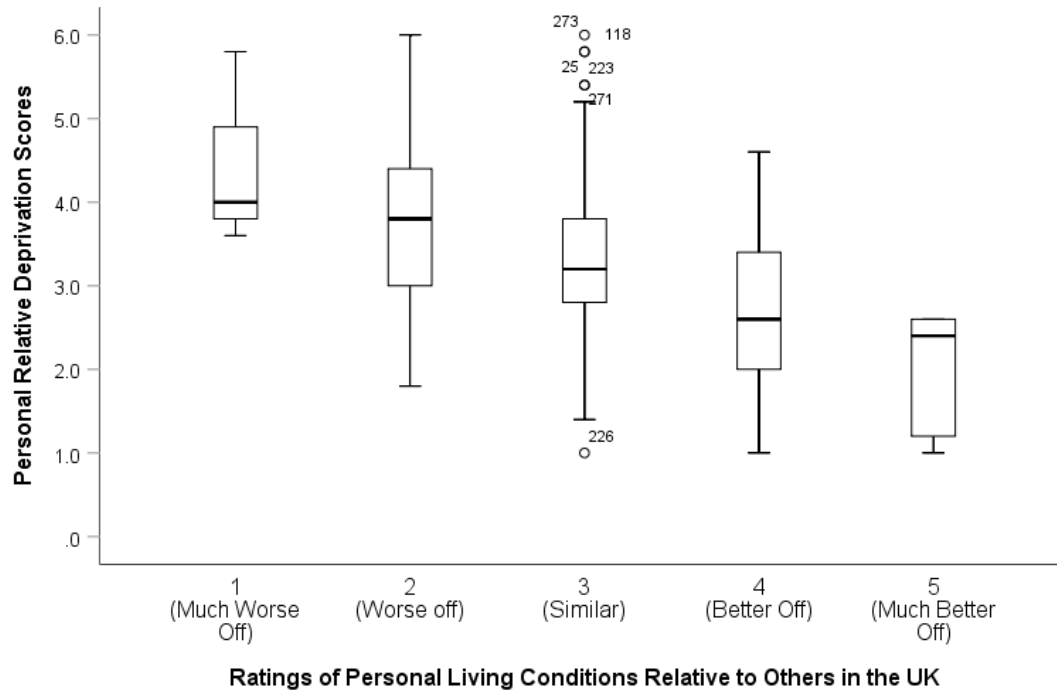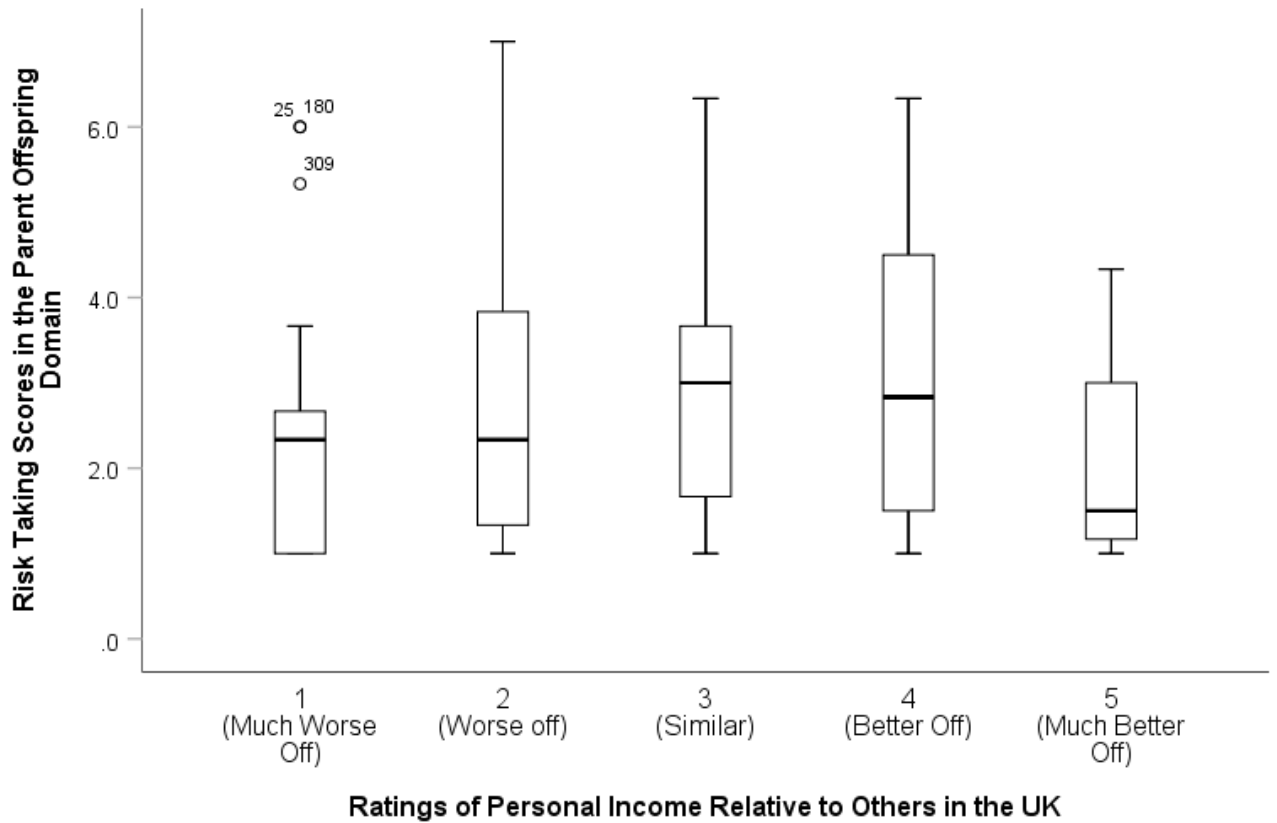

Note. Participants are grouped according to their answer to the question "In general, how do you rate your income compared to those of other people in the United Kingdom?". Spearman's rho test showed that ratings were positively associated with risk taking scores in the parent offspring conflict domain, r_s = .125, *p* = .025.

Figure 8.19

Study 3 Association Between Ratings of Personal Living Conditions Relative to Others in the UK and Risk-Taking Scores in the Parent Offspring Conflict Domain
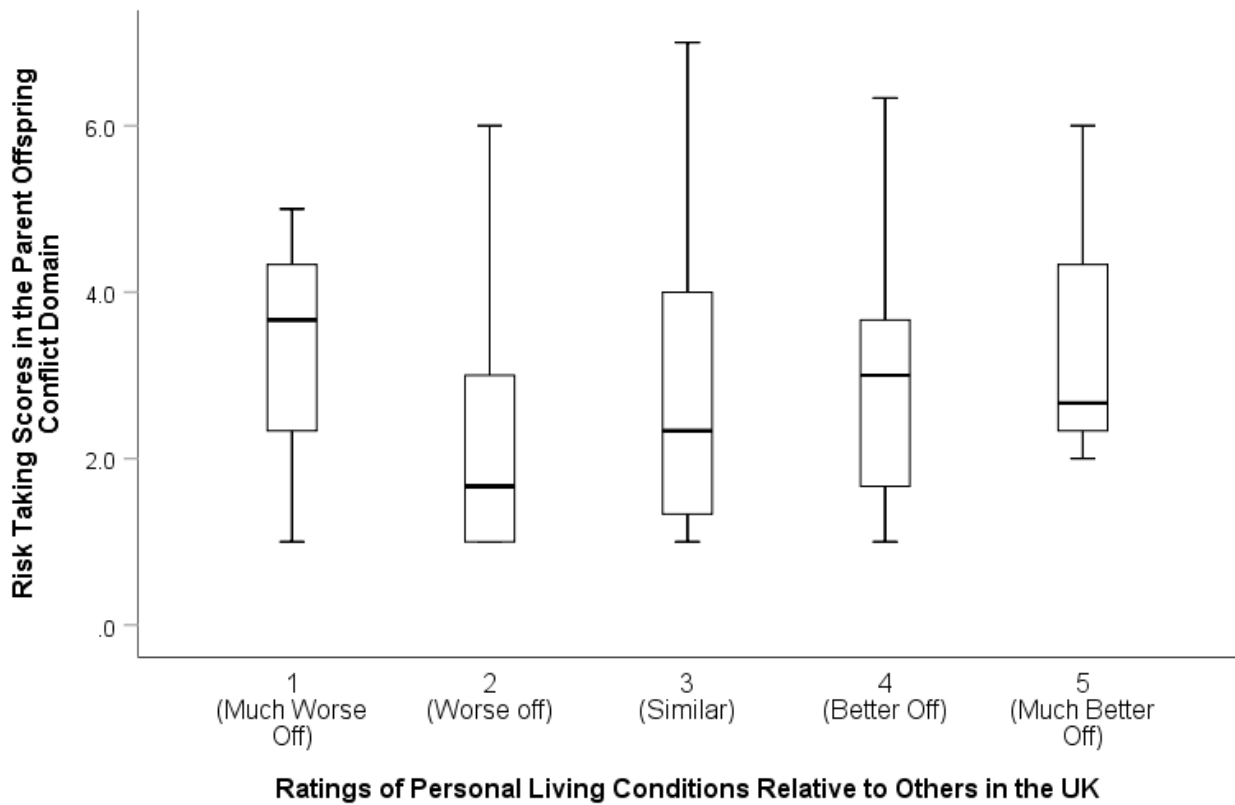
Note. Participants are grouped according to their answer to the question "In general, how do you rate your living conditions compared to those of other people in the United Kingdom?". Spearman's rho test showed that ratings were positively associated with risk taking scores in the parent offspring conflict domain, r_s = .125, p = .025.

Figure 8.20

Study 3 Association Between Ratings of Personal Living Conditions to Others in Participants'

Relative Neighbourhoods and Risk-Taking Scores in the Mate Attraction Domain
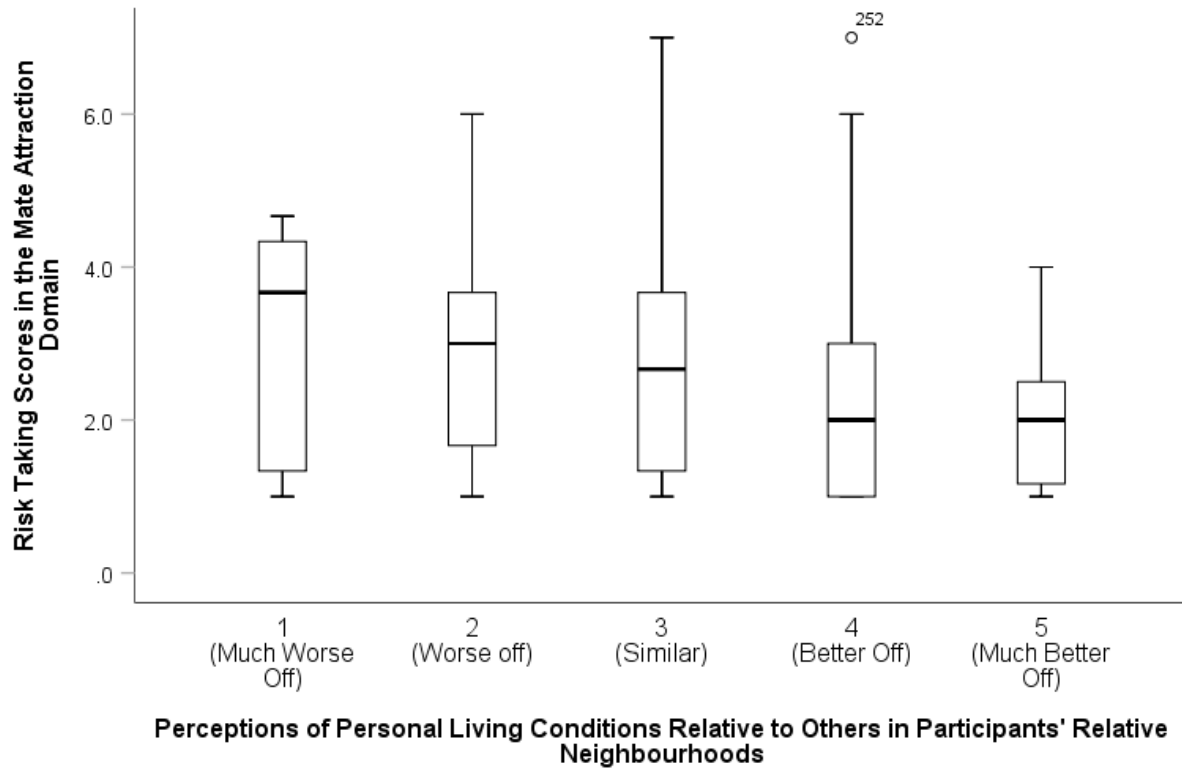
Note. Participants are grouped according to their answer to the question "In general, how do you rate your living conditions compared to those of other people in your local area / neighbourhood?". Spearman's rho test showed that ratings were positively associated with risk taking scores in the mate attraction domain, r_s = -.144, p = .010.

8.3. Appendix O – Study 3 Scale Descriptive Scores According to Participant Diagram Choices for the Socioeconomic Distribution in the UK

Table 8.4

Study 3 Full Means and Standard Deviations for the CFC, Impulsivity, Aggression, PRD and the Domains of the Evolutionary Risk Scale for Participants who Chose Diagrams A, B, C, and D as Most Closely Representing the Socioeconomic Distribution in the UK

Scale variables	Diagram A M (SD)	Diagram B M (SD)	Diagram C M (SD)	Diagram D M (SD)
CFC	39.44 (8.05)	38.87 (7.91)	40.34 (8.69)	41.00 (8.25)
Impulsivity	7.70 (5.16)	7.18 (5.11)	4.99 (4.32)	6.59 (4.41)
Aggression (Overall)	2.89 (1.74)	2.98 (1.89)	2.99 (1.86)	3.05 (1.63)
Direct Aggression	2.72 (1.91)	2.84 (2.04)	2.70 (1.96)	2.87 (1.81)
Indirect Aggression	2.75 (1.73)	2.87 (1.94)	2.93 (1.83)	2.92 (1.65)
Between group competition (ERS)	2.46 (1.28)	2.64 (1.26)	2.21 (1.07)	2.46 (1.24)
Within group competition (ERS)	3.45 (1.37)	3.48 (1.30)	3.51 (1.19)	3.46 (1.21)
Status/power (ERS)	1.63 (.861)	1.57 (.939)	1.53 (.809)	1.36 (.890)
Environmental exploration (ERS)	2.73 (1.38)	2.76 (1.61)	2.70 (1.29)	2.81 (1.52)
Food selection (ERS)	3.80 (1.34)	3.94 (1.23)	3.83 (1.31)	3.96 (1.49)
Food acquisition (ERS)	2.79 (1.16)	2.81 (1.21)	3.01 (1.15)	2.94 (1.27)
Parent-offspring conflict (ERS)	2.76 (1.61)	2.89 (1.63)	2.59 (1.42)	2.86 (1.49)
Kinship (ERS)	5.58 (1.34)	5.57 (1.28)	5.32 (1.10)	5.58 (1.35)
Mate attraction (ERS)	2.92 (1.40)	2.73 (1.50)	2.51 (1.22)	2.34 (1.41)
Mate retention (ERS)	2.09 (1.14)	2.06 (1.09)	1.88 (1.09)	2.05 (1.12)
PRD	17.31 (5.17)	15.56 (4.56)	15.58 (4.86)	14.02 (4.78)

Note. "ERS" – Evolutionary Risk Scale

8.4. Appendix P - Study 3 ANCOVAs for PRD and Perceived Shape of the UK Socioeconomic Distribution as Predictors of Risk-Taking in Domains not Associated with Intra-sexual Competition

When looking at perceived UK inequality as the independent factor, PRD scores as a covariate, and risk scores in the environmental exploration domain as the dependent, no significant effects were found in models, either including, $F(7, 306) = .272$, $p = .965$, $\eta p^2 = .006$, or excluding the interaction term $F(4, 309) = .059$, $p = .993$, $\eta p^2 = .001$. Full ANCOVA results can be found in Table 8.5.

Table 8.5

Study 3 ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictive Factors for Risk-Taking Scores in the Environmental Exploration Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp²	Observed Power	R²	Adjusted R²
Model 1									
Corrected Model Perception of UK inequality	.517a	4	.129	.059	.993	.001	.062	.001	-.012
	0.516	3	.172	.079	.971	.001	.064		
PRD	0.015	1	.015	.007	.934	<.001	.051		
Error	672.385	309	2.176						
Model 2									
Corrected Model Perception of UK inequality	4.157a	7	.594	.272	.965	.006	.131	.006	-.017
	3.396	3	1.132	.518	.670	.005	.156		
PRD Perception of UK inequality * PRD	.005	1	.005	.002	.961	<.001	.050		
	3.64	3	1.213	.555	.645	.005	.164		
Error	668.745	306	2.185						

When looking at perceived local inequality as the independent factor, PRD scores as a covariate, risk-taking scores in the food selection domain as the dependent, and the inclusion of an interaction term, PRD showed a significant effect, $F(1, 306) = 8.184$, $p = .004$, $\eta p^2 = .026$, despite the lack of significance of the overall model, $F(7, 306) = 1.494$, $p = .169$, $\eta p^2 = .033$. Full ANCOVA results can be seen in Table 8.6.

Table 8.6

Study 3 ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictive Factors for Risk-Taking Scores in the Food Selection Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	14.775	4	3.694	2.136	.076	.027	.630	.027	.014
Perception of UK inequality	.450	3	.15	.087	.967	.001	.066		
PRD	13.478	1	13.478	7.792	.006	.025	.795		
Error	534.465	309	1.73						
Model 2									
Corrected Model	18.151	7	2.593	1.494	.169	.033	.626	.033	.011
Perception of UK inequality	3.366	3	1.122	.647	.586	.006	.185		
PRD	14.377	1	14.377	8.284	.004	.026	.818		
Perception of UK inequality * PRD	3.376	3	1.125	.648	.584	.006	.186		
Error	531.089	306	1.736						

When looking at perceived UK inequality as the independent factor, PRD scores as a covariate, and risk scores in the food acquisition domain as the dependent, no significant effects were found in models, either including, $F(7, 306) = .862$, $p = .537$, $\eta p^2 = .019$, or excluding the interaction term $F(4, 309) = .778$, $p = .540$, $\eta p^2 = .010$. Full ANCOVA results can be found in Table 8.7.

Table 8.7

Study 3 ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictive Factors for Risk-Taking Scores in the Food Acquisition Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp²	Observed Power	R²	Adjusted R²
Model 1									
Corrected Model Perception of UK inequality	4.439	4	1.11	.778	.540	.010	.249	.010	-.003
	3.211	3	1.07	.751	.523	.007	.21		
PRD	1.818	1	1.818	1.276	.260	.004	.203		
Error	440.466	309	1.425						
Model 2									
Corrected Model Perception of UK inequality	8.601	7	1.229	.862	.537	.019	.371	.019	-.003
	3.226	3	1.075	.754	.521	.007	.211		
PRD Perception of UK inequality * PRD	2.125	1	2.125	1.49	.223	.005	.229		
	4.162	3	1.387	.973	.406	.009	.265		
Error	436.304	306	1.426						

When looking at perceived UK inequality as the independent factor, PRD scores as a covariate, and risk scores in the parent-offspring conflict domain as the dependent, no significant effects were found in models, either including, $F(7, 306) = 1.425$, $p = .195$, $\eta p^2 = .032$, or excluding the interaction term $F(4, 309) = .828$, $p = .508$, $\eta p^2 = .011$. Full ANCOVA results can be found in Table 8.8.

Table 8.8

Study 3 ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictive Factors for Risk-Taking Scores in the Parent-Offspring Conflict Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	7.964	4	1.991	.828	.508	.011	.264	.011	-.002
Perception of UK inequality	4.897	3	1.632	.679	.566	.007	.193		
PRD	3.761	1	3.761	1.564	.212	.005	.238		
Error	743.375	309	2.406						
Model 2									
Corrected Model	23.715	7	3.388	1.425	.195	.032	.601	.032	.009
Perception of UK inequality	12.325	3	4.108	1.728	.161	.017	.450		
PRD	4.222	1	4.222	1.775	.184	.006	.264		
Perception of UK inequality * PRD	15.751	3	5.25	2.208	.087	.021	.558		
Error	727.624	306	2.378						

When looking at perceived UK inequality as the independent factor, PRD scores as a covariate, and risk scores in the kinship domain as the dependent, no significant effects were found in models, either including, $F(7, 306) = .757$, $p = .624$, $\eta p^2 = .036$, or excluding the interaction term $F(4, 309) = .851$, $p = .494$, $\eta p^2 = .011$. Full ANCOVA results can be found in Table 8.9.

Table 8.9

Study 3 ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictive Factors for Risk-Taking Scores in the Kinship Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	5.532	4	1.383	.851	.494	.011	.271	.011	-.002
Perception of UK inequality	3.498	3	1.166	.717	.542	.007	.202		
PRD	2.171	1	2.171	1.336	.249	.004	.211		
Error	502.174	309	1.625						
Model 2									
Corrected Model	8.637	7	1.234	.757	.624	.017	.326	.017	-.005
Perception of UK inequality	3.71	3	1.237	.758	.518	.007	.212		
PRD	2.651	1	2.651	1.625	.203	.005	.246		
Perception of UK inequality * PRD	3.105	3	1.035	.635	.593	.006	.183		
Error	499.068	306	1.631						

When looking at perceived UK inequality as the independent factor, PRD scores as a covariate, risk-taking scores in the mate attraction domain as the dependent, and the inclusion of an interaction term, only a significant effect of PRD was found, $F(1, 306) = 7.607$, $p < .006$, $\eta p^2 = .024$. Full ANCOVA results can be seen in Table 8.10.

Table 8.10

Study 3 ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictive Factors for Risk-Taking Scores in the Mate Attraction Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	27.698	4	6.925	3.599	.007	.045	.871	.045	.032
Perception of UK inequality	8.41	3	2.803	1.457	.226	.014	.385		
PRD	13.785	1	13.785	7.165	.008	.023	0.761		
Error	594.473	309	1.924						
Model 2									
Corrected Model	32.779	7	4.683	2.431	.019	.053	.865	.053	.031
Perception of UK inequality	7.849	3	2.616	1.358	.256	.013	.360		
PRD	14.652	1	14.652	7.607	.006	.024	.785		
Perception of UK inequality * PRD	5.081	3	1.694	.879	.452	.009	.242		
Error	589.392	306	1.926						

When looking at perceived UK inequality as the independent factor, PRD scores as a covariate, risk-taking scores in the mate selection domain as the dependent, and the inclusion of an interaction term, there was a significant effect of PRD, $F(1, 306) = 13.067$, $p = .001$, $\eta p^2 = .035$, and a significant interaction, $F(3, 306) = 3.524$, $p = .030$, $\eta p^2 = .029$. Full ANCOVA results can be seen in Table 8.11.

Table 8.11

Study 3 ANCOVAs with and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictive Factors for Risk-Taking Scores in the Mate Selection Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	12.741	4	3.185	2.668	.032	.033	.740	.033	.021
Perception of UK inequality	2.089	3	0.696	0.583	.626	.006	.171		
PRD	10.78	1	10.78	9.029	.003	.028	.850		
Error	368.96	309	1.194						
Model 2									
Corrected Model	23.314	7	3.331	2.844	.007	.061	.920	.061	.040
Perception of UK inequality	8.641	3	2.88	2.459	.063	.024	.609		
PRD	13.067	1	13.067	11.157	.001	.035	.915		
Perception of UK inequality * PRD	10.573	3	3.524	3.009	.030	.029	.707		
Error	358.387	306	1.171						

Post-hoc regression analyses indicated that PRD was significantly associated with risk-taking scores in the mate selection domain for those who chose diagrams B (a pyramid with a small elite at the top, more people in the middle and most at the bottom), $F(1, 101) = 5.011$, $p = .027$, and D (a society with most people in the middle), $F(1, 61) = 12.910$, $p = .001$, as most closely representing the UK socioeconomic distribution. There was an association between higher feelings of deprivation and higher risk-taking scores in the mate selection domain, for both of these groups, with a stronger association in group D, $r = .418$, $p<.001$, than in group B, $r = .217$, $p = .014$. Full post-hoc regression results can be seen in Table 8.12.

Table 8.12

Study 3 Post-Hoc Regression Results PRD as a Predictor of Risk-Taking Scores in the Mate Selection Domain for Each Group of Participants who Chose Diagrams A-D as Most Representative of Tthe UK Socioeconomic Distribution

	β	Standardised β	F	p	R^2	Adjusted R^2	Pearson R (p)
Diagram A	-.011	-.050	.197	.659	.003	-.010	-.050 (.329)
Diagram B	.052	.217	5.011	.027	.047	.038	.217 (.014)
Diagram C	.034	.152	1.563	.216	.023	.008	.152 (.108)
Diagram D	.098	.418	12.910	.001	.175	.161	.418 (<.001)

8.5. Appendix Q - ANCOVAs for PRD and Perceived Shape of participant Local Neighbourhood Socioeconomic Distribution as Predictors of Risk-Taking in Domains not Associated with Intra-sexual Competition

When looking at perceived local inequality as the independent factor, PRD scores as a covariate, and risk scores in the environmental exploration domain as the dependent, no significant effects were found in models, either including, $F(7, 281) = .968$, $p = .455$, $\eta p^2 = .024$, or excluding the interaction term $F(4, 284) = 1.361$, $p = .248$, $\eta p^2 = .019$. Full ANCOVA results can be found in Table 8.13.

Table 8.13

Study 3 ANCOVAs with and without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the Local Socioeconomic Distribution as Predictive Factors for Risk-Taking Scores in the Environmental Exploration Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	11.913	4	2.978	1.361	.248	.019	.423	.019	.005
Perception of local inequality	11.869	3	3.956	1.808	.146	.019	.468		
PRD	.009	1	.009	.004	.948	<.001	.05		
Error	621.42	284	2.188						
Model 2									
Corrected Model	14.910	7	2.13	.968	.455	.024	.416	.024	-.001
Perception of local inequality	6.382	3	2.127	.967	.409	.01	.263		
PRD	.240	1	.24	.109	.741	<.001	.063		
Perception of local inequality * PRD	2.997	3	.999	.454	.715	.005	.141		
Error	618.423	281	2.201						

When looking at perceived local inequality as the independent factor, PRD scores as a covariate, and risk taking scores in the food selection domain as the dependent, only PRD was a significant predictive factor, $F(1, 284) = 8.105$, $p = .005$, $\eta p^2 = .028$. The overall model no longer reached significance when an interaction term was included, $F(7, 281) = 1.833$, $p = .081$, $\eta p^2 = .044$, despite still showing PRD as a significant predictive factor, $F(1, 281) = 5.956$, $p = .015$, $\eta p^2 = .021$. Full ANCOVA results can be seen in Table 8.14.

Table 8.14

Study 3 ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the Local Socioeconomic Distribution as Predictive Factors for Risk-Taking Scores in the Food Selection Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	16.482	4	4.121	2.46	.046	.033	.70	.033	.020
Perception of local inequality	2.159	3	0.72	.430	.732	.005	.136		
PRD	13.576	1	13.576	8.105	.005	.028	.81		
Error	475.678	284	1.675						
Model 2									
Corrected Model	21.491	7	3.07	1.833	.081	.044	.732	.044	.020
Perception of local inequality	5.424	3	1.808	1.079	.358	.011	.291		
PRD	9.977	1	9.977	5.956	.015	.021	.682		
Perception of local inequality * PRD	5.009	3	1.67	0.997	.395	.011	.270		
Error	470.668	281	1.675						

When looking at perceived local inequality as the independent factor, PRD scores as a covariate, and risk taking scores in the food selection domain as the dependent, neither models including, $F(7, 281) = 1.833$, $p = .081$, $\eta p^2 = .044$, or excluding, $F(7, 281) = 1.833$, $p = .081$, $\eta p^2 = .044$ the interaction term were significant. Despite the lack of significance of the model that included the interaction term, the interaction term itself reached levels of significance $F(7, 281) = 1.833$, $p = .081$, $\eta p^2 = .044$. Full ANCOVA results can be seen in Table 8.15.

Table 8.15

Study 3 ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the Local Socioeconomic Distribution as Predictive Factors for Risk-Taking Scores in the Food Acquisition Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	3.073	4	.768	.537	.709	.008	.179	.008	-.006
Perception of local inequality	2.598	3	.866	.605	.612	.006	.176		
PRD	.701	1	.701	.49	.485	.002	.107		
Error	406.521	284	1.431						
Model 2									
Corrected Model	14.573	7	2.082	1.481	.174	.036	.62	.036	.012
Perception of local inequality	9.745	3	3.248	2.311	.076	.024	.578		
PRD	.509	1	.509	.362	.548	.001	.092		
Perception of local inequality * PRD	11.5	3	3.833	2.727	.044	.028	.658		
Error	395.021	281	1.406						

Post-hoc regression analyses indicated that PRD was associated with risk-taking scores in the food acquisition domain only for those who chose diagram A (a small elite at the top, very few people in the middle, and the great mass of people at the bottom) as most closely representing their local socioeconomic distribution, $F(1, 65) = 4.892$, $p = .030$, with those who reported feeling more deprived, reporting less risk-taking in the food acquisition domain, $r = -.265$, $p = .015$. Full regression results can be seen in Table 8.16.

Table 8.16

Study 3 Post-Hoc Regression Results PRD as a Predictor of Risk-Taking Scores in the Food Acquisition Domain for Each Group of Participants Who Chose Diagrams A-D as Most Representative of Their Local Socioeconomic Distribution

	β	Standardised β	F	p	R^2	Adjusted R^2	Pearson R (p)
Diagram A	-.059	-.265	4.892	.030	.070	.056	-.265 (.015)
Diagram B	.047	.197	2.794	.099	.039	.025	.197 (.050)
Diagram C	.022	.074	.236	.629	.005	-.018	.074 (.315)
Diagram D	.029	.116	1.425	.235	.014	.004	.116 (.118)

When looking at perceived local inequality as the independent factor, PRD scores as a covariate, and risk scores in the parent-offspring conflict domain as the dependent, no significant effects were found in models, either including, $F(7, 281) = .893$, $p = .512$, $\eta p^2 = .022$, or excluding the interaction term $F(4, 284) = .983$, $p = .412$, $\eta p^2 = .014$. Full ANCOVA results can be found in Table 8.17.

Table 8.17

Study 3 ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the Local Socioeconomic Distribution as Predictive Factors for Risk-Taking Scores in the Parent-Offspring Conflict Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	9.332	4	2.333	0.983	.417	.014	.31	.014	<.001
Perception of local inequality	8.091	3	2.697	1.137	.335	.012	.305		
PRD	1.85	1	1.85	0.78	.378	.003	.142		
Error	673.898	284	2.373						
Model 2									
Corrected Model	14.866	7	2.124	0.893	.512	.022	.384	.022	-.003
Perception of local inequality	5.913	3	1.971	0.829	.479	.009	.229		
PRD	.588	1	.588	0.247	.619	.001	.079		
Perception of local inequality * PRD	5.533	3	1.844	0.775	.509	.008	.216		
Error	668.365	281	2.379						

When looking at perceived local inequality as the independent factor, PRD scores as a covariate, and risk scores in the kinship domain as the dependent, no significant effects were found in models, either including, $F(7, 281) = 1.558$, $p = .148$, $\eta p^2 = .037$, or excluding the interaction term $F(4, 284) = 1.765$, $p = .136$, $\eta p^2 = .024$. Full ANCOVA results can be found in Table 8.18.

Table 8.18

Study 3 ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the Local Socioeconomic Distribution as Predictive Factors for Risk-Taking Scores in the Kinship Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	11.722	4	2.931	1.765	.136	.024	.536	.024	.011
Perception of local inequality	9.023	3	3.008	1.811	.145	.019	.469		
PRD	4.022	1	4.022	2.422	.121	.008	.341		
Error	471.588	284	1.661						
Model 2									
Corrected Model	18.061	7	2.58	1.558	.148	.037	.647	.037	.013
Perception of local inequality	2.693	3	.898	.542	.654	.006	.161		
PRD	1.394	1	1.394	.842	.360	.003	.15		
Perception of local inequality * PRD	6.339	3	2.113	1.276	.283	.013	.34		
Error	465.249	281	1.656						

When looking at perceived local inequality as the independent factor, PRD scores as a covariate, and risk taking scores in the mate attraction domain as the dependent, only PRD was a significant predictive factor, $F(1, 284) = 5.965$, $p = .015$, $\eta p^2 = .021$. However, when an interaction term was included, no factors appeared to be significant, despite the overall significance of the model, $F(7, 281) = 2.663$, $p = .011$, $\eta p^2 = .062$. Full ANCOVA results can be seen in Table 8.19.

Table 8.19

Study 3 ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictive Factors for Risk-Taking Scores in the Mate Attraction Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	22.585	4	5.646	2.869	.024	.039	.774	.039	.025
Perception of local inequality	10.237	3	3.412	1.734	.160	.018	.451		
PRD	11.74	1	11.74	5.965	.015	.021	.682		
Error	558.97	284	1.968						
Model 2									
Corrected Model	36.180	7	5.169	2.663	.011	.062	.898	.062	.039
Perception of local inequality	7.879	3	2.626	1.353	.257	.014	.359		
PRD	4.508	1	4.508	2.323	.129	.008	.33		
Perception of local inequality * PRD	13.595	3	4.532	2.335	.074	.024	.583		
Error	545.376	281	1.941						

When looking at perceived local inequality as the independent factor, PRD scores as a covariate, and risk scores in the mate selection domain as the dependent, both perceptions of local inequality, $F(3, 284) = 3.529$, $p = .015$, $\eta p^2 = .041$, and PRD, $F(1,36284) = 12.237$, $p = .001$, $\eta p^2 = .041$ were shown to be significant factors. However, when an interaction term was included, only PRD, $F(1, 281) = 8.341$, $p = .004$, $\eta p^2 = .029$, remained significant. Full ANCOVA results can be seen in Table 8.20.

Table 8.20

Study 3 ANCOVAs With and Without an Interaction Term for Personal Relative Deprivation and Perceived Shape of the UK Socioeconomic Distribution as Predictive Factors for Risk-Taking Scores in the Mate Selection Domain

	Type III Sum of Squares	df	Mean Square	F	p	ηp^2	Observed Power	R^2	Adjusted R^2
Model 1									
Corrected Model	24.084	4	6.021	5.133	.001	.067	.966	.067	.054
Perception of local inequality	12.419	3	4.14	3.529	.015	.036	.781		
PRD	14.353	1	14.353	12.237	.001	.041	.937		
Error	333.102	284	1.173						
Model 2									
Corrected Model	25.707	7	3.672	3.113	.004	.072	.944	.072	.049
Perception of local inequality	.519	3	.173	.147	.932	.002	.077		
PRD	9.84	1	9.84	8.341	.004	.029	.821		
Perception of local inequality * PRD	1.622	3	.541	.458	.712	.005	.142		
Error	331.48	281	1.18						

8.6. Appendix R – MHI: Masculine Honor Ideology Questionnaire

The following questionnaire (Barnes, Brown & Osterman, 2012) was used to

measure the extent to which participants adhered to masculine honour ideology in Study 4.

"Please rate the extent to which you agree with each of the following statements on a scale from 1 (*strongly disagree*) to 9 (*strongly agree*)."

	1	2	3	4	5	6	7	8	9
1. A man has the right to act with physical aggression toward another man who calls him an insulting name.	O	O	O	O	O	O	O	O	O
2. A real man doesn't let other people push him around.	O	O	O	O	O	O	O	O	O
3. A man has the right to act with physical aggression toward another man who slanders his family.	O	O	O	O	O	O	O	O	O
4. A real man can always take care of himself.	O	O	O	O	O	O	O	O	O
5. A man has the right to act with physical aggression toward another man who openly flirts with his wife.	O	O	O	O	O	O	O	O	O
6. A real man never lets himself be a "door mat" to other people.	O	O	O	O	O	O	O	O	O
7. A man has the right to act with physical aggression toward another man who trespasses on his personal property.	O	O	O	O	O	O	O	O	O
8. A real man can "pull himself up by his bootstraps" when the going gets tough.	O	O	O	O	O	O	O	O	O
9. A man has the right to act with physical aggression toward another man who mistreats his children	O	O	O	O	O	O	O	O	O
10. A real man will never back down from a fight.	O	O	O	O	O	O	O	O	O
11. A man has the right to act with physical aggression toward another man who steals from him.	O	O	O	O	O	O	O	O	O
12. A real man never leaves a score unsettled.	O	O	O	O	O	O	O	O	O
13. A man has the right to act with physical aggression toward another man who vandalizes his home.	O	O	O	O	O	O	O	O	O
14. A real man doesn't take any crap from anybody.	O	O	O	O	O	O	O	O	O
15. A man has the right to act with physical aggression toward another man who insults his mother.	O	O	O	O	O	O	O	O	O
16. A real man is seen as tough in the eyes of his peers.	O	O	O	O	O	O	O	O	O

8.8. Appendix S – Study 4 Pre-registration and Ethical Approval

As Predicted: "Economic views, personal beliefs and values (Survey Study)" (#25708)

Created: 07/11/2019 09:50 AM (PT)

Author(s)

Jaye McLaughlin (Brunel University London) - jaye.mclaughlin@brunel.ac.uk

Nicholas Pound (Brunel University London) - nicholas.pound@brunel.ac.uk

1) Have any data been collected for this study already?

No, no data have been collected for this study yet.

2) What's the main question being asked or hypothesis being tested in this study?

In males, there will be a negative association between perceived personal relative deprivation and a) consideration of the future, and positive associations between perceived personal relative deprivation and b) impulsivity; c) masculine honour ideology; d) indirect aggression; and e) direct aggression.

3) Describe the key dependent variable(s) specifying how they will be measured.

Perceived personal relative deprivation will be measured using the 5-item Personal Relative Deprivation (PRD) scale (Callan et al., 2011).

Consideration of the future will be measured using the 12-item Consideration of Future Consequences (CFC) scale (Strathman et al., 1994).

Impulsivity will be measured using the Impulsiveness scale from the I7 Impulsiveness Questionnaire (Eysenck et al, 1985).

Masculine honour ideology will be measured using the 16-item Honor Ideology for Manhood (HIM) scale (Barnes et al., 2012).

Aggressiveness will be measured using the 8-items assessing the likelihood of behaving aggressively in a hypothetical social situation from Griskevicius et al. (2009) which yield an "indirect aggression" scale score, and a "direct aggression" scale score.

4) How many and which conditions will participants be assigned to?

N/A – this is a cross-sectional survey study with no experimental manipulation.

5) Specify exactly which analyses you will conduct to examine the main question/hypothesis.

Multivariate GLM will be used to test whether PRD predicts a) CFC, b) Impulsivity, c) HIM; d) indirect aggression; and e) direct aggression scale scores. Pearson's correlation coefficients will be reported to quantify the strength of bivariate associations between PRD and each of the dependent measures.

6) Describe exactly how outliers will be defined and handled, and your precise rule(s) for excluding observations.

Participants who provide identical responses to all items on the PRD, CFC, or Impulsiveness scale will have their scores on that scale excluded. Each of these scales includes reverse coded items – so identical responses to all items would mean inconsistency across items and likely reflect lack of attention. Where a variable is missing for a particular participant - pairwise deletion will be used to exclude participants only from analyses involving that variable.

7) How many observations will be collected or what will determine sample size?

No need to justify decision, but be precise about _exactly_ how the number will be determined.

We will recruit 194 males living in the UK via the Prolific Academic participant recruitment platform.

8) Anything else you would like to pre-register?

(e.g., secondary analyses, variables collected for exploratory purposes, unusual analyses planned?)

Scale internal consistencies will be reported (Cronbach's alpha). For completeness, inter-correlations between CFC, Impulsivity, HIM and aggressiveness scores will be examined on an

exploratory basis. Relationships between demographic variables (age, employment status, educational level, self-reported income) and the dependent measures will be examined on an exploratory basis. Alternative measures of perceived personal relative deprivation (adapted from the International Social Survey Programme and Afrobarometer) are included for exploratory purposes (to examine how they relate to PRD scale scores). Participants are asked to provide their geographical location (UK post code). These data will be combined with data from a previous study that measured PRD and geographic location to examine, for exploratory purposes, whether there are associations between neighbourhood socioeconomic variables and perceived deprivation.

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17 June 2019

LETTER OF APPROVAL

Applicant: Dr Nicholas Pound

Project Title: Economic views, personal beliefs and values

Reference: 17259-LR-Jun/2019- 19370-1

Dear Dr Nicholas Pound

The Research Ethics Committee has considered the above application recently submitted by you.

The Chair, acting under delegated authority has agreed that there is no objection on ethical grounds to the proposed study. Approval is given on the understanding that the conditions of approval set out below are followed:

- A7 – This is a group application. The co applicant is Jaye McLaughlin.

- A18 – Advert - Please add to the advert the date of approval and the expiry date (your end date).

- The agreed protocol must be followed. Any changes to the protocol will require prior approval from the Committee by way of an application for an amendment.

Please note that:

- Research Participant Information Sheets and (where relevant) flyers, posters, and consent forms should include a clear statement that research ethics approval has been obtained from the relevant Research Ethics Committee.
- The Research Participant Information Sheets should include a clear statement that queries should be directed, in the first instance, to the Supervisor (where relevant), or the researcher. Complaints, on the other hand, should be directed, in the first instance, to the Chair of the relevant Research Ethics Committee.
- The Research Ethics Committee reserves the right to sample and review documentation, including raw data, relevant to the study.

Professor Christina Victor

Chair of the College of Health and Life Sciences Research Ethics Committee (DLS)

Brunel University London

8.9. Appendix T – Study 4 Full Bivariate Associations

Table 8.21

Study 4 Bivariate Associations for all Study 4 Variables, Using Pearson's Coefficients For Scale Variables (1 - 6), and Spearman's Rho for Correlations Involving Non-Scale Ordinal Variables (7 - 12)

Measure	Statistic	1. MHI	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.
2.Personal relative deprivation (PRD)	r/r_s	.192	-	-	-	-	-	-	-	-	-	-	-
	p	.009	-	-	-	-	-	-	-	-	-	-	-
	N	186	-	-	-	-	-	-	-	-	-	-	-
3.Overall aggression	r/r_s	.340	.193	-	-	-	-	-	-	-	-	-	-
	p	<.001	.008	-	-	-	-	-	-	-	-	-	-
	N	192	189	-	-	-	-	-	-	-	-	-	-
4.Direct aggression	r/r_s	.348	.228	.864	-	-	-	-	-	-	-	-	-
	p	<.001	.002	<.001	-	-	-	-	-	-	-	-	-
	N	192	189	195	-	-	-	-	-	-	-	-	-
5.Indirect aggression	r/r_s	.258	.120	.900	.557	-	-	-	-	-	-	-	-
	p	<.001	.099	<.001	<.001	-	-	-	-	-	-	-	-
	N	192	189	195	195	-	-	-	-	-	-	-	-
6.Impulsivity (EIS)	r/r_s	.141	.202	.085	.130	.027	-	-	-	-	-	-	-
	p	.052	.006	.239	.071	.704	-	-	-	-	-	-	-
	N	191	188	194	194	194	-	-	-	-	-	-	-
7.Consideration of future consequence (CFC)	r/r_s	-.156	-.313	-.099	-.108	-.070	-.497	-	-	-	-	-	-
	P	.031	<.001	.168	.132	.333	<.001	-	-	-	-	-	-
	N	192	189	195	195	195	194	-	-	-	-	-	-
8.Perceived personal social position (ISSP)	r_s	.126	-.469	.019	-.040	.080	-.142	.177	-	-	-	-	-
	P	.081	<.001	.791	.580	.266	.049	.013	-	-	-	-	-
	N	192	189	195	195	195	194	195	-	-	-	-	-
	r_s	.016	-.235	.008	-.032	.054	-.033	.030	.499	-	-	-	-
	p	.826	.001	.912	.658	.455	.649	.679	<.001	-	-	-	-

9.Perceived family social position (ISSP)	N	192	189	195	195	195	194	195	195	-	-	-	-
10.Income relative to UK (AB)	r_s	.092	-.491	-.024	-.075	.027	-.047	.155	.638	.232	-	-	-
	p	.206	<.001	.738	.296	.705	.512	.030	<.001	.001	-	-	-
	N	192	189	195	195	195	194	195	195	195	-	-	-
11.Living conditions relative to UK (AB)	r_s	-.081	-.447	-.127	-.174	-.045	-.077	.164	.457	.312	.573	-	-
	p	.266	<.001	.076	.015	.534	.286	.022	<.001	<.001	<.001	-	-
	N	192	189	195	195	195	194	195	195	195	195	-	-
12.Income relative to neighbourhood (AB)	r_s	.222	-.276	-.009	-.042	.030	.061	.047	.424	.169	.551	.285	-
	p	.002	<.001	.905	.556	.675	.400	.518	<.001	.018	<.001	<.001	-
	N	192	189	195	195	195	194	195	195	195	195	195	-
12.Living conditions relative to neighbourhood (AB)	r_s	.091	-.196	-.073	-.072	-.043	.038	-.010	.107	.149	.172	.359	.510
	p	.211	.007	.310	.317	.546	.603	.891	.137	.037	.016	<.001	<.001
	N	192	189	195	195	195	194	195	195	195	195	195	195

8.10. Appendix U - Study 4 Associations With Measures of Personal Social Position
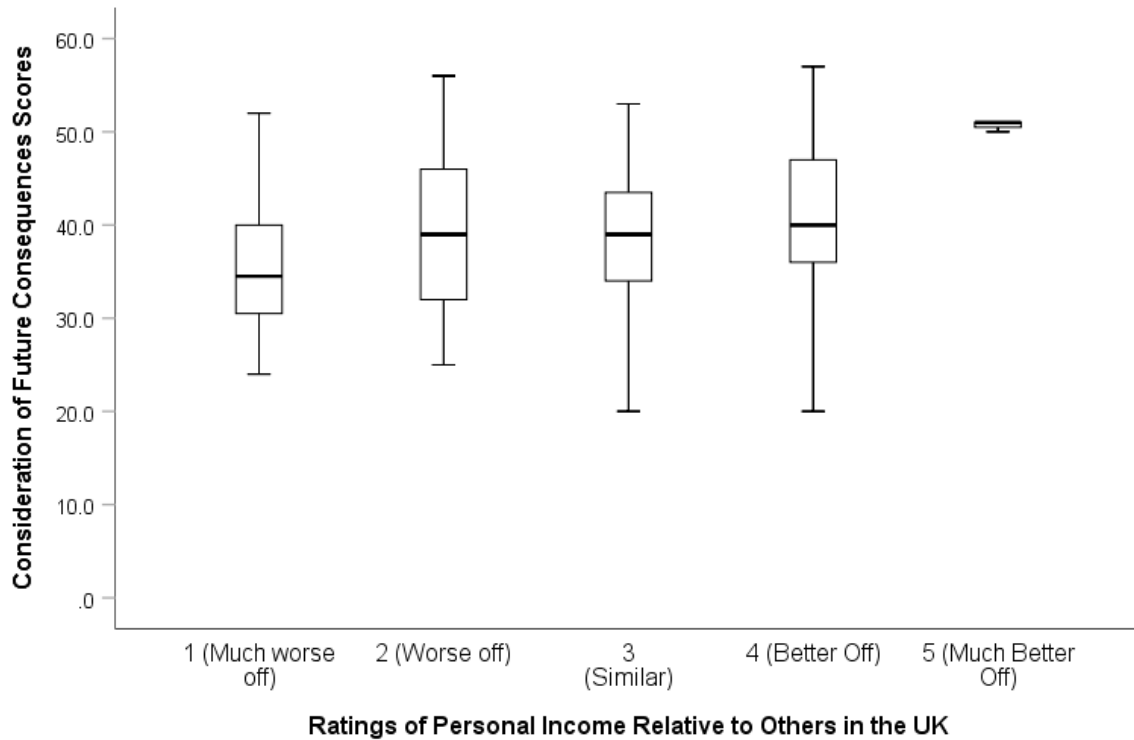
Figure 8.21

Study 4 Association Between Perceived Current Personal Position in Society and Consideration of Future Consequences (CFC) Scores
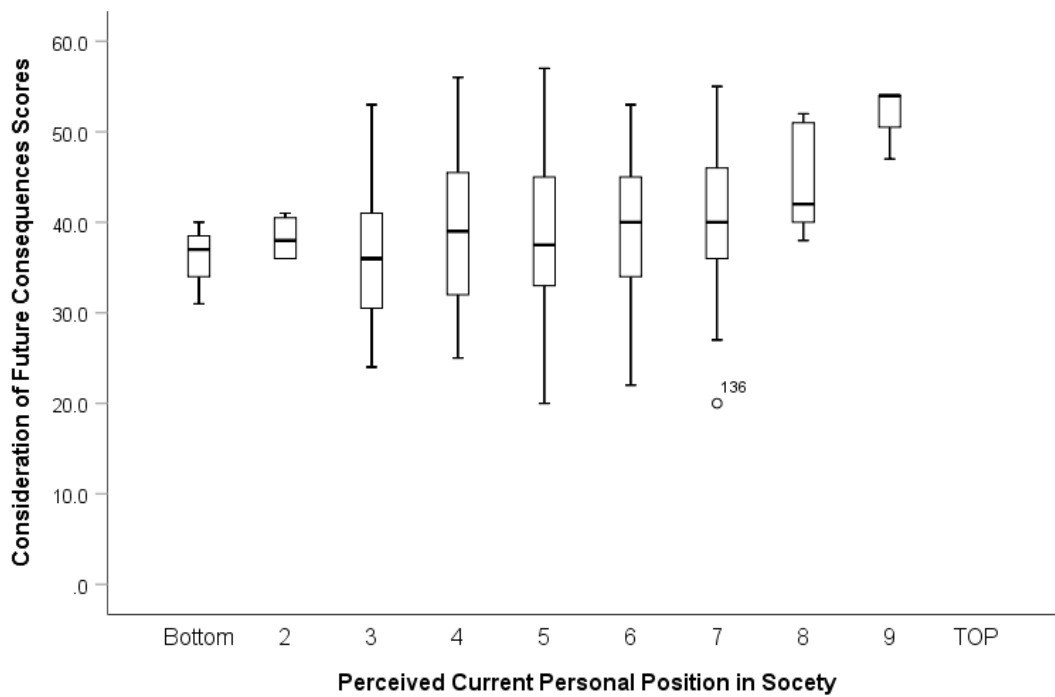
Note. Participants are grouped according to their answer to the question "In our society there are groups which tend to be towards the top and groups which tend to be towards the bottom. Below is a scale that runs from top to bottom. Where would you put yourself now on this scale?". Spearman's rho test showed that perceived current personal position in society was positively associated with CFC scores, $r_s(193) = .177$, $p = .013$.

Figure 8.22

Study 4 Association Between Ratings of Personal Income Relative to Others in the UK and Consideration of Future Consequences (CFC) Scores
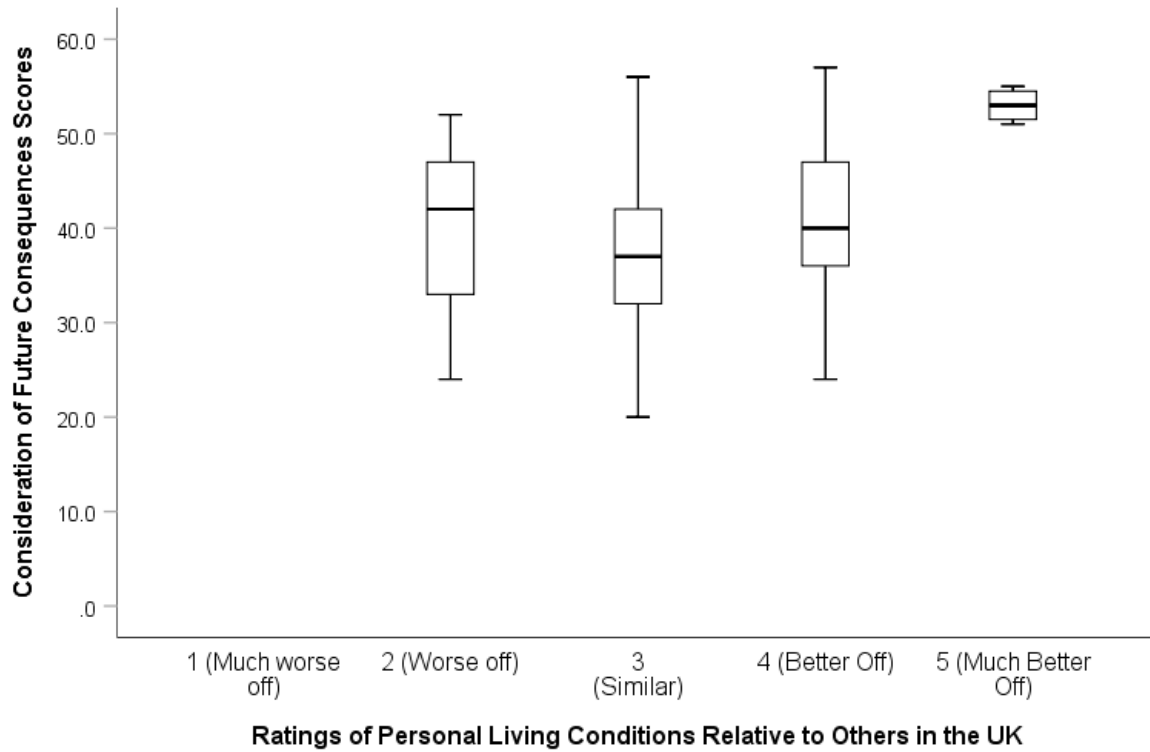

Note. Participants are grouped according to their answer to the question "In general, how do you rate your income compared to those of other people in the United Kingdom?". Spearman's rho test showed that ratings were positively associated with CFC scores, r_s (193) = .155, p = .030.

Figure 8.23

Study 4 Association Between Ratings of Personal Living Conditions Relative to Others in the UK and Consideration of Future Consequences (CFC) Scores

Note. Participants are grouped according to their answer to the question "In general, how do you rate your living conditions compared to those of other people in the United Kingdom?". Spearman's rho test showed that ratings were positively associated with CFC scores, r_s (193) = .164, *p* = .022

Figure 8.24

Study 4 Association Between Ratings of Personal Living Conditions Relative to Others in the UK and Direct Aggression Scores
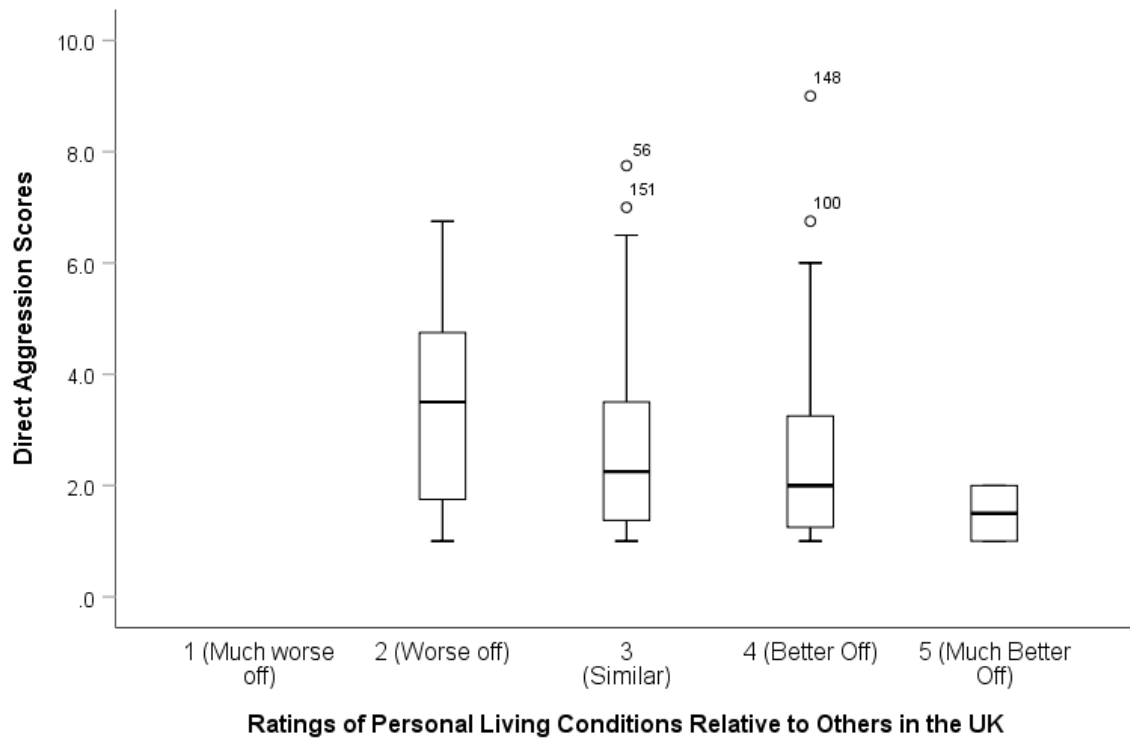
Note. Participants are grouped according to their answer to the question "In general, how do you rate your living conditions compared to those of other people in the United Kingdom?". Spearman's rho test showed that ratings were positively associated with direct aggression scores, r_s (193) = -.174, *p* = .015.