THE ROLE OF MOTION SMOOTHNESS, SYNCHRONY, AND CULTURE IN AESTHETIC PERCEPTION OF HUMAN MOVEMENT: FROM THE METHOD OF PRODUCTION TO THE METHOD OF CHOICE

A Thesis Submitted for the Degree of Doctor of Philosophy

By

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Dedicated to the loving memory of my paternal grandfather (1934 - 2016).

DECLARATION

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CONTENTS

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ABSTRACT

Research on aesthetic perception of dance has been recently generating considerable interest within the field of Psychology of Aesthetics. There are, however, a number of methodological and conceptual gaps in our knowledge such as the application of the method of production, as well as understanding the role of motion smoothness, synchronous movement, and cultural factors in aesthetic perception. The present basic research addresses those gaps through five psychological experiments. In study 1, participants generated static sequences of images according their preference. Smooth continuation of meaningful objects was preferred when considering implied motion. In study 2, participants sorted images into moving sequences that they would like to see. Participants liked movements with smooth motion. In study 3, participants rated different schematic video animations depicting two dancers. Participants preferred smooth movements preformed in synchrony. In study 4, participants rated video animations depicting different types of motion performed by human body or abstract shapes. Participants preferred smooth synchrony. In study 5, British and Japanese participants watched synchronous and asynchronous actual dance video clips, rated the videos according their aesthetic judgement and answered questionnaires about motivations and individualism/collectivism. British participants preferred asynchronous dance while Japanese participants preferred synchronous dance. Studies 1 and 2 applied the method of production for the first time to study aesthetic preference for human movement, studies 1 to 4 support the neurocognitive model of aesthetic appreciation in the performing arts. Study 5 supports our cultural hypothesis: British participants preferred asynchrony (in line with analytical perceptual style, Western focus on individual movements), whereas Japanese participants preferred synchrony (holistic style, Eastern focus on group movement). Convergence between the neurocognitive model and the cultural hypothesis is discussed. The present research opens new lines of research in perception of human movement and performing arts: the method of production, motion smoothness, synchrony, and cross-cultural aesthetics.

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CHAPTER 1

GENERAL INTRODUCTION

1.1 Overview

The present chapter will introduce the domain of psychology of human movement aesthetics. It will cover the main theoretical and methodological perspectives in the field, as well as their gaps in knowledge. Based on the theoretical and methodological gaps, the chapter develops research questions, aims and conceptual frameworks, which will be the foundation of the present research.

1.2 Theoretical Perspectives

1.2.1 Psychology of Aesthetics: Human Movement and Dance

Why do we like what we like? Such question has been addressed from Psychology of aesthetics using empirical methods to study the role of psychological variables in the visual and auditory aesthetic experience, mainly in the visual arts and music (Christensen & Calvo-Merino, 2013; Nadal & Skov, 2013). Recently, experimental research has started to study aesthetic experience in the performing arts, such as dance (Christensen & Calvo-Merino, 2013). This new domain explores psychological mechanisms involved in processing of body movements and its contribution to the aesthetic experience based on this type of stimuli. To explain these psychological processes there are psychological theories that contribute to the developing discussion to why humans find beauty in some type movements and dances. Examples of those theories are embodied cognition (Glenberg & Kaschak, 2002; Glenberg et al., 2008), processing fluency theory (Reber, Schwarz, & Winkielman, 2004), and the neurocognitive model of dance appreciation (Orgs, Caspersen, & Haggard, 2016).

1.2.1.1 Embodied cognition and aesthetic perception of human movement.

According to the theoretical framework of embodied cognition, cognitive and motor processes are linked. Embodied cognition maintains that the way humans understand the environment is based on their bodily experiences (Glenberg & Kaschak, 2002; Glenberg et al., 2008). The theoretical framework of embodied cognition has been developed in psychology of aesthetics to explain preferences for watching human movement and dance (Calvo-Merino, Jola, Glaser, & Haggard, 2008; Cross, Kirsch, Ticini, & Schütz-Bosbach, 2011; Daprati, Iosa, & Haggard, 2009; Kirsch, Dawson, & Cross, 2015; Kirsch, Drommelschmidt, & Cross, 2013). Some studies have found preferences for watching movements that are familiar and easier to perform (Kirsch et al., 2015; Kirsch et al., 2013), while other studies have found preferences for watching movements/postures that are unfamiliar and more difficult to perform (Calvo-Merino et al., 2008; Cross et al., 2011; Daprati et al., 2009). Despite the contradictory findings, embodied cognition research has the common explanation that aesthetic preference for watching human movement is interpreted in terms of observers' motor familiarity: if a familiar aesthetic object is preferred, it is liked because of motor familiarity (Kirsch et al., 2015; Kirsch et al., 2013); if an unfamiliar aesthetic object is preferred, it is liked in spite of the lack of motor familiarity (Cross et al., 2011).

Nevertheless, beyond some of these contradictions, research based on mirror neuron system hypothesis (Gallese, Fadiga, Fogassi, & Rizzolatti, 1996) has been transferred to empirical aesthetics, consistently supporting embodied cognition claims about the role of bodily experience in aesthetic perception of human movement. These studies have found that activity increases in both visual and motor brain areas when the observed movements are familiar (Calvo-Merino, Glaser, Grèzes, Passingham, & Haggard, 2005; Calvo-Merino, Grezes, Glaser, Passingham, & Haggard, 2006; Cross, Hamilton, & Grafton, 2006; Orgs, Dombrowski, Heil, & Jansen-Osmann, 2008), meaning that perception of familiar movements implies cognitive representations of previous motor experience. In other words, in line with embodied cognition, spectators are not passive observers that just assimilate or

copy the visual information of a dance scene, but are actively recreating familiar movements, visually, and bodily.

Overall, these findings from the embodied cognition framework (Glenberg & Kaschak, 2002; Glenberg et al., 2008) and from the mirror neurons hypothesis (Gallese et al., 1996), point towards the notion of embodied aesthetics: the idea that aesthetic perception is influenced by observer's own bodily experience (Kirsch, Urgesi, & Cross, 2016; Ticini, Urgesi, & Calvo-Merino, 2015). For example, embodied aesthetics suggests that spectators recreate implicitly the observed dance moves that are performed by a dancer, and that such covert simulation influences their aesthetic experience of watching dance (Kirsch et al., 2016; Ticini et al., 2015). In other words, if observers watch a dance move identical or similar to movements they have performed in the past, not only visual areas will be more active, but also, sensorimotor areas involved in the execution of those observed movements. Such brain activation correlated to covert simulation of observed movements has been detected with neuroscientific techniques (Calvo-Merino et al., 2008; Calvo-Merino, Urgesi, Orgs, Aglioti, & Haggard, 2010; Cross et al., 2011; Kirsch et al., 2015). If observers are not familiarised with the observed movements, only visual areas respond (Calvo-Merino et al., 2005). In line with the embodied aesthetics notion, it has been found that motor resonance correlates with aesthetic preference for watching familiar dance moves (Kirsch et al., 2015). However, as mentioned before, some studies also suggest that observers prefer movements that they cannot perform (Cross et al., 2011). Moreover, embodied aesthetics is not limited to appreciation of performing arts, it has been found that motor activation is correlated to the aesthetic experience of watching paintings that abstractly or figuratively represents implied motion (Battaglia, Lisanby, & Freedberg, 2011; Umilta, Berchio, Sestito, Freedberg, & Gallese, 2012), and body sculptures (Di Dio, Macaluso, & Rizzolatti, 2007).

In brief, it has been proposed that embodying movement is closely linked to aesthetic appreciation of movement. It has been proposed that embodiment of observed actions is an empathetic response, which is part of the aesthetic experience (Ticini et al., 2015). Following this theoretical explanation, it can be said that if observers can establish an aesthetic connection with the observed artwork or performance through memories, past experiences, judgements, emotions, etc., such

inner dialogue will bodily resonate within the viewer, finally resulting in aesthetic liking (Ticini et al., 2015).

1.2.1.2 Processing fluency theory.

Another psychological theory that has been proposed to explain aesthetic preference for moving visual displays (Topolinski, 2010) and human movement (Orgs, Hagura, & Haggard, 2013) is the processing fluency theory (Reber et al., 2004). According to processing fluency theory, people prefer information that is easier to process, this is, aesthetic information that can be processed fluently.

Fluency increments aesthetic preference judgements and judgements of liking as well (Reber et al., 2004). Properties that are independent of the content of an object such as figure-ground contrast, symmetry, prototypicality and repeated exposure increases fluency, which consequently influences aesthetic preference (Reber et al., 2004). Positive affect mediates this process and has a bidirectional relation with fluency: positive mood influences fluency and fluency influences positive affect. It has been hypothesised that such hedonic mark has an adaptive value to facilitate the selection of familiar stimuli and to identify stimuli faster (Reber et al., 2004). However, sometimes a low fluency stimulus is preferred over a high fluency stimulus. This depends on processing motivation (Reber et al., 2004). When processing motivation is heuristic, immediate or under time pressure a high fluency stimulus will be preferred. Usually this is the processing motivation that can be found in a novice observer. When processing motivation is systematic and analytic, and guided by aesthetic concepts, a low fluency stimulus will be preferred. This is the kind of processing motivation proper of expert observers (Reber et al., 2004).

Currently, the notion of visual fluency regarding aesthetic perception of static images is still addressed in empirical studies. For instance, affective experience of visual fluency has been studied by assessing the concepts of fluency amplification (Albrecht & Carbon, 2014) and felt fluency (Forster, Fabi, & Leder, 2015a; Forster, Gerger, & Leder, 2015b; Forster, Leder, & Ansorge, 2013; Forster, Leder, & Ansorge, 2016). Fluency amplification refers to how processing fluency echoes the emotional impact of an observed stimulus (Albrecht & Carbon, 2014). For example, if, initially, an observer perceives a stimulus as positive, later, the same stimulus will

be perceived as more positive, if stimulus' fluency is increased (Albrecht & Carbon, 2014). On the other hand, felt fluency, also known as subjective fluency, is the affective experience of perceiving a fluent stimulus (e.g. observers feel they are seeing images that are easy to watch). In turn, objective fluency is what we call "fluency" or processing fluency, in the present thesis (and in the field of psychology of aesthetics in general), which has been defined as the ease to process information (Forster et al., 2015a; Forster, et al., 2015b; Forster et al., 2013; Forster et al., 2016).Globally, these recent findings suggest that visual fluency is not only related to cognitive mechanisms, but also, to emotional processes.

It is worth noting that to be processed more fluently means it is easier to process information. Some information is easier to process than other under certain conditions. For instance, higher symmetry, contrast, and familiarity, increase fluency (Reber et al., 2004), this is, those conditions increase the easiness, accuracy or speed to process or decode information from the environment. For example, higher contrast increases fluency because it enhances visual saliency, which facilitates visual detection (Reber et al., 2004). If the stimuli have the conditions to facilitate an optimal processing of information, processing fluency will increase.

It has been proposed that fluency can be objectively measured through reaction times and judgement accuracy (Reber et al., 2004).Thus, conditions that facilitate faster/efficient processing of information, will increase processing fluency. In other words, the smaller the reaction time, the faster the stimulus is processed; the more accurate the judgement, the more efficient the processing (Reber, et al., 2004). As we mentioned before, another way to measure fluency is through subjective measures, where researchers ask participants through questionnaires whether they feel the stimulus is easy to process (Forster et al., 2015a; Forster et al., 2015b; Forster et al., 2013; Forster et al., 2016). Objective and subjective fluency will correlate within subjects, depending on individual characteristics, such as, level of expertise and familiarity (Orgs et al., 2016).

Moreover, there is a link between the notion of embodiment and the concept of fluency: motor fluency. Motor fluency is the ease to process information due to motor familiarity (Casasanto & Chrysikou, 2011). The notion of motor fluency leads us to the distinction between visual fluency and motor fluency. Visual fluency can be

developed through exposure, which leads to visual familiarity alone, while motor fluency is developed through practice, which leads to motor familiarity (Orgs et al., 2016). For example, a frequent visitor of classical ballet performances will develop visual familiarity regarding the most watched ballet moves, while a professional ballet dancer will develop both visual and motor familiarity regarding the most observed and practiced moves. In this sense, there are instances in which fluency can be embodied, as in the case of motor fluency.

For instance, it has been found that professional typists, unaware of the relation between watching letter dyads and typing them, preferred to watch letter dyads that are easier to type than dyads that are more difficult to type, whereas non-experts did not show preference any preference (Beilock & Holt, 2007). Such pattern in experts was interpreted as an embodied preference for perceiving visual stimuli that activated a covert simulation of fluent motor representations. In contrast, most difficult dyads were not preferred because watching them activated a covert simulation of motor interference (Beilock & Holt, 2007).

Another study found that animations of moving dots are preferred when observer's eye movements go along with the observed motion (Topolinski, 2010). This has been interpreted as motor fluency evoked by eye movement itself, which going in line with the observed moving dots, facilitates an ease to process those visual stimuli (Topolinski, 2010).

In the specific case of aesthetic experience of watching dance, Calvo-Merino et al. (2008) found increased BOLD signal in visual and premotor areas when novice observers watched preferred ballet and capoeira moves displayed in video clips. Other fMRI studies found similar motor activations when expert dancers observed dance video clips of movements they were able to perform (Calvo-Merino et al., 2005; Calvo-Merino et al., 2006). Calvo-Merino et al. (2008) interpreted this as an association between motor resonance and aesthetic liking that is present when watching a dance move that 'neurotarget' motor areas. Such stimulation can be interpreted as perceptual fluency, since those preferred dance moves optimally stimulate visual and motor areas, possibly facilitating an ease to process the observed information (Orgs et al., 2016).

All these findings from previous research show that visual and motor fluency influence preference and aesthetic experience. As seen, processing fluency theory has been used to explain aesthetic preference for static stimuli in visual arts. Also, it has been used to explain preferences for watching visual displays in motion such as animations of black and white dots (Topolinski, 2010) and apparent human movement (Orgs et al., 2013). However, the concept of fluency alone is helpful to explain preference for familiar static visual displays in visual arts, but has limitations to explain aesthetic preference for unfamiliar human movements in the performing arts (Orgs et al., 2016). Based on this criticism of processing fluency theory, Orgs et al. (2016) proposed a neurocognitive model of aesthetic appreciation in the performing arts.

1.2.1.3 Neurocognitive model of aesthetic appreciation in the performing arts.

This model proposed by Orgs et al. (2016, see figure 1.1) synthetises embodied cognition and processing fluency theory because it recognises the role of motor familiarity and extends the notion of fluency to the appreciation of performing arts. The result of such synthesis is the theoretical prediction that familiar movements will be preferred if the observer adopts a low cognitive effort strategy of aesthetic appreciation, this is, aesthetic judgements based on positive valence (e.g. judgement of beauty, likeability or pleasantness), favouring the appreciation of fluency's positive hedonic mark (Orgs et al., 2016). On the other hand, disfluency (not fluency) will predict aesthetic preference if the observer adopts a high cognitive effort strategy of aesthetic appreciation. In this case, the judgements will be based on judgements of aesthetic arousal (e.g. interestingness), and then unfamiliar movements will be preferred (Orgs et al., 2016). The model predicts that experts will adopt a high cognitive effort strategy because expert judgement can apply aesthetic concepts developed through explicit learning. Since novices have not developed such aesthetic concepts, the model predicts that non-experts will typically adopt a low cognitive effort strategy, which is almost exclusively based on the physical properties of the observed movement itself, rather than on possible conceptual interpretations derived from watching it (Orgs et al., 2016). In summary, while appreciating fluency

is mediated by positive affect (Bullot & Reber, 2013) and requires low cognitive effort (Orgs et al., 2016), appreciating disfluency is mediated by analytical thinking (Bullot & Reber, 2013) and requires high cognitive effort (Orgs et al., 2016).

We have highlighted the cognitive components of the neurocognitive model of performing arts' aesthetic appreciation (e. g., visual fluency, embodied cognition, expertise, etc.). The neuronal component of the model refers to brain areas and mechanisms related to the aesthetic processing of movement. Such mechanisms are divided in two groups: brain mechanisms related to fluent processing of movement and familiarity, and brain mechanisms related to syntactic and semantic novelty detection (Orgs et al., 2016).

According to the neurocognitive model of dance appreciation (Orgs et al., 2016), watching aesthetic movements facilitates the activation of brain areas and mechanisms involved in processing that type of visual information, and the more those areas are activated, the more aesthetic pleasure is induced. Therefore, aesthetic pleasure derives from the congruency between the observed motion and the activation of the brain region involved in processing the stimuli. That congruency means that some brain structures are able to easily process features of the observed object, and such processing fluency increases aesthetic liking. For instance, brain mechanisms involved in processing of simple motion patterns (low-level visual parameters) are associated to the activation of the primary visual cortex and early visual areas, specifically, the V5 area (Orgs et al., 2016). According to the model, if observing a simple motion optimally activates the V5 area, that fluent processing of movement will induce aesthetic pleasure (Orgs et al., 2016).

Regarding more complex movements, such as in dance, the neurocognitive model proposes that visual and motor familiarity will increase processing fluency, which in turn, will increase aesthetic liking. Such familiarisation with some dance moves can be developed through learning (Orgs et al., 2013). Following the notion of stimulation of neural connections (Hebb, 1949), the neurocognitive model (Orgs et al., 2016) states that perception of a novel stimulus facilitates new neural connections, and that stimulus repetition will activate the same neural connections easily. Accordingly, the neurocognitive model proposes that watching familiar movements will facilitate the automatic activation of visual and motor neural

representations with low cognitive effort, increasing processing fluency and deriving in aesthetic pleasure for the observer.

The neurocognitive model of aesthetic appreciation in the performing arts (Orgs et al., 2016) proposes that brain mechanisms involved in syntactic novelty detection will be activated when watching unexpected, complex and surprising dance moves that violate implicitly learned compositional rules (Orgs et al., 2013). The neurocognitive model points that one of these types of brain mechanisms involved in syntactic novelty detection, in sequence information processing of human movement, is the Event Related Potential (ERP) P300 wave, a positive deflection that appears 300 ms after stimulus presentation (Orgs et al., 2016).

Finally, the neurocognitive model (Orgs et al., 2016) proposes that brain mechanisms involved in semantic novelty detection will be activated when watching abstract and ambiguous dance moves that do not communicate a clear goal or meaning. The neurocognitive model highlights that one of these types of brain mechanisms involved in semantic novelty detection of human movement processing, is the ERP N400 wave, a negative deflection that appears 400 ms after action observation (Orgs et al., 2016).

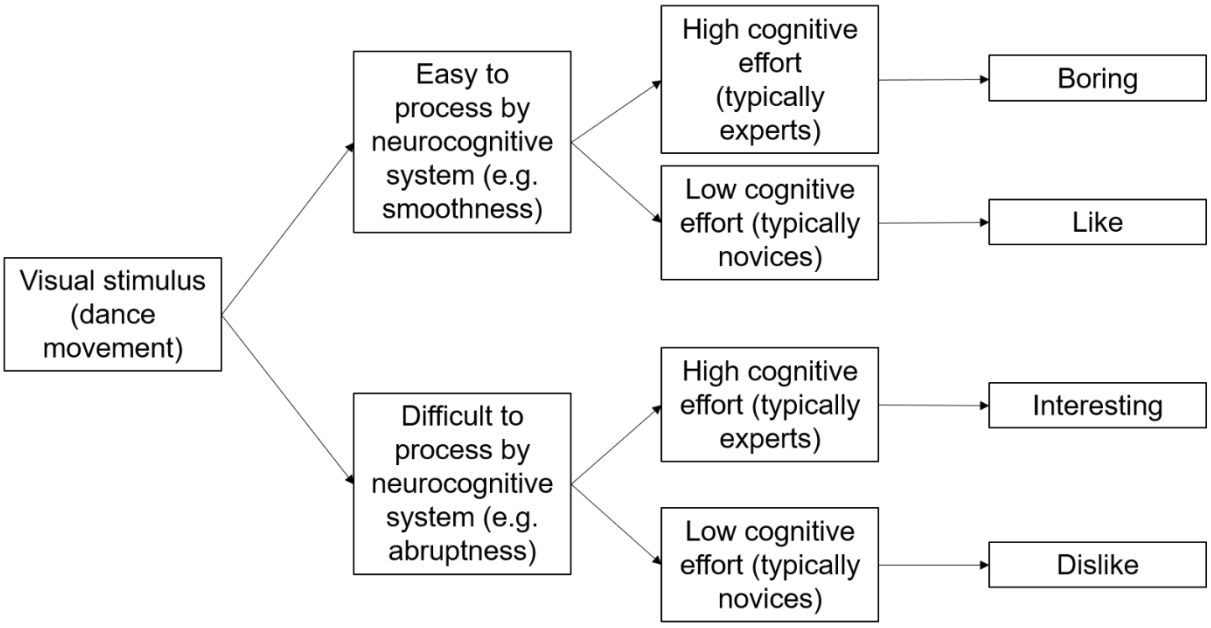

Figure 1.1. Visual representation of the neurocognitive model of aesthetic appreciation in the performing arts. Adapted from Orgs et al. (2016).

1.3 Methodological Perspectives

1.3.1 Method of Use, Method of Choice, and Method of Production

Traditionally, in experimental aesthetics there are three approaches: the method of use, the method of choice, and the method of production. These approaches were introduced by Gustav Fechner in 1871 and are still widely used (Westphal-Fitch, Oh, & Fitch, 2013).

The method of use is a naturalistic approach that consists in the observation of an aesthetic object trying to preserve its ecological validity (Westphal-Fitch et al., 2013). The method of choice is an experimental approach in which a participant rates the aesthetic preference for stimuli created by the researcher (Westphal-Fitch et al., 2013). Currently, the method of choice is the most applied in empirical aesthetics (Westphal-Fitch et al., 2013). For instance, experiments on aesthetic appreciation of human movement/dance applied the method of choice presenting visual stimuli such as dance videogames (Kirsch et al., 2015; Kirsch et al., 2013), Apparent Biological Motion (ABM) (Orgs et al., 2013), live dance performances (Jola, Abedian-Amiri, Kuppuswamy, Pollick, & Grosbras, 2012), dance video clips (Calvo-Merino et al., 2008; Cross et al., 2011; Miura et al., 2010), body posture images (Calvo-Merino et al., 2010), moving stick figures (Bronner & Shippen, 2015), and static stick figures/polygons (Daprati et al., 2009).

It is worth noting that all these reviewed stimuli presented individual movements only, excepting (Kirsch et al., 2015; Kirsch et al., 2013) who showed group dance moves in the dance videogames. However, (Kirsch et al., 2015; Kirsch et al., 2013) focused on the aesthetic experience of the observer that repeated the movements individually, and treated the group dance as a single entity, without deepening on the meaning of watching group dance. Thus, all the reviewed research on dance perception focused on dance solos, without exploring the aesthetic experience of watching group dance. This means that the existing literature on movement appreciation has been missing the study of group dance. Dancing in groups is relevant to psycho-aesthetics of human actions because it poses a new aesthetic feature in the visual configuration of motion display: synchronous human movement.

Previous research has mentioned the importance of studying synchronous human movement, because, among other things, it is one of the most basic aesthetics features of dance across time, cultures, and styles (Christensen & Calvo-Merino, 2013), however, as a reflection of the present literature review, we note it has been not studied yet. We will expand on this aesthetic feature of group dance later in the sections on gaps in knowledge, research questions, and in experiments 3, 4, and 5.

Following with the methodological review, in experiments applying the method of choice, participants' aesthetic responses have been recorded through Likert scales (Cross et al., 2011; Kirsch et al., 2015; Kirsch et al., 2013; Miura et al., 2010), Visual Analogue Scales (VAS) (Calvo-Merino et al., 2010; Orgs et al., 2013), rankings (Bronner & Shippen, 2015), semantic differential scales (Calvo-Merino et al., 2008), and forced choice (Calvo-Merino et al., 2010; Daprati et al., 2009; Orgs et al., 2013).

The experimental paradigm of previous studies that have applied the method of choice has been behavioural. Some of them have been behavioural experiments alone (Bronner & Shippen, 2015; Daprati et al., 2009; Kirsch et al., 2013; Orgs et al., 2013), while neuroaesthetics of dance appreciation have used behavioural experiments in combination with neuroscientific techniques such as Transcranial Magnetic Stimulation (TMS) (Calvo-Merino et al., 2010), and Functional Magnetic Resonance Imaging (fMRI) (Calvo-Merino et al., 2008; Cross et al., 2011; Kirsch et al., 2015; Miura et al., 2010) to correlate aesthetic experience with brain activity.

The method of production is another experimental approach, but according to Westphal-Fitch et al. (2013), despite its advantages, it is the most neglected of the three approaches. In the method of production, participants create an aesthetic object under controlled experimental conditions. One of its main advantages is that experimenter's preconceptions and cultural norms bias is more controlled in comparison with the method of choice. Its main disadvantage is that participants' production will be so diverse and variable that sometimes it is not suitable for statistical analysis (McManus, Cook, & Hunt, 2010; Westphal-Fitch et al., 2013). However, it is possible to design production tasks with enough limitations to control diversity and variability and to measure aesthetic patterns at the same time

(McManus et al., 2010; Westphal-Fitch et al., 2013). For example, the method of production has been used to study preference for visual stimuli regarding symmetry (Westphal-Fitch et al., 2013) and the golden section (McManus et al., 2010).

1.4 The Present Research

1.4.1 Gap in Knowledge

Despite the growing research on empirical aesthetics of human movement, there are still pending areas that merit further study. Based on the current theoretical and methodological perspectives, four main areas of conceptual and methodological gaps have been identified.

First, the method of production has not been applied in empirical aesthetics of human movement. Second, previous studies have explored the link between aesthetic perception and motor familiarity (Calvo-Merino et al., 2008; Cross et al., 2011; Daprati et al., 2009; Kirsch et al., 2015; Kirsch et al., 2013), however, they have compared feasible movements only. Some of the movements have been familiar/high in feasibility while others have been unfamiliar/low in feasibility, but all of them have been movements that are possible to perform in real life. Familiar/feasible movements have not been compared against unfamiliar/unfeasible movements. Therefore, there is still a gap in knowledge about aesthetic perception of movement feasibility. Third, another conceptual gap is the research on aesthetic perception of movement synchrony. There are social psychology studies on the social effects of behavioural synchrony (Reddish, Fischer, & Bulbulia, 2013; Wiltermuth & Heath, 2009), but there is not published work on the aesthetic perception of synchronous movement. Perception of synchronous movement has been proposed as a research topic for psychology of aesthetics (Christensen & Calvo-Merino, 2013), but it has not been empirically tested. Fourth, despite previous studies have mentioned the need for researching cultural differences in aesthetic perception of human movement (Christensen & Calvo-Merino, 2013; Daprati et al., 2009; Jola, Pollick, & Calvo-Merino, 2014), this kind of cultural comparisons have not been empirically tested so far.

It is worth noting that applying the method of production is important to psychology of aesthetics in general because it has an advantage over the method of choice. Since in the method of production participants create their own stimuli, it overcomes researcher's potential biases in stimuli design, a limitation that can be present in the method of choice (Westphal-Fitch et al., 2013). Also, the method of production is relevant for human movement psycho-aesthetics in particular since it can study the aesthetic experience of participants watching their own "choreography", whereas the method of choice studies participants watching other's "choreography". In other words, the application of the method of production and the method of choice in psycho-aesthetics of performing arts allows us to compare the aesthetic experience of novices as "choreographers" (method of production) and novices as the "audience" (method of choice). This means that findings from both the method of production and the method of choice can complement each other to offer a bigger picture of participants' aesthetic experience, to determine whether participants' responses were specifically induced by one method or the other, or whether they constitute an overall consistent pattern.

1.4.2 Research Questions

Considering the gap in knowledge on aesthetic perception of human movement, the following questions will be addressed in the present research: Can the method of production be applied to empirical aesthetics of human movement? Will the method of production and the method of choice yield different results? What is the role of movement feasibility in aesthetic perception? What is the aesthetic effect of movement feasibility when perceived in combination with other aesthetic features such as imagery and synchrony? What is the role of culture in aesthetic perception of human movement?

1.4.3 Research Aims

To answer the research questions, the aims of the present research are twofold: methodological and conceptual. The methodological aim is to apply the method of production to study aesthetic perception of human movement. This will be done in

the first two studies (the sequence production experiment, and the production of animations task). The conceptual aim is to study the aesthetic effects of the interaction between movement feasibility, imagery and synchrony. This will be addressed in the third and fourth studies applying the method of choice (the perception of human body video animations experiment, and the perception of abstract and human body video animations experiment). Finally, the fifth study (the cross-cultural experiment) will apply the method of choice to explore another related conceptual aim: the influence of culture on aesthetic perception of synchronous movement.

1.4.4 Conceptual Framework

For the first four experiments, the conceptual framework of the present research is the neurocognitive model of aesthetic appreciation in the performing arts (Orgs, et al., 2016) because it allows to address the research aims of preference for movement feasibility. We will extend the prediction of aesthetic appreciation in novices to perception of human movement feasibility. According to the model, novice's low cognitive effort appreciation will be driven by fluency. It is expected that fluency will predict novice's preference for feasible and familiar movements. In line with this prediction, it is also expected that novices will dislike unfeasible and unfamiliar movements.

A new theoretical model will be proposed to study cultural differences in aesthetic perception of human movement (fifth experiment). Since there are no previous studies on empirical cross-cultural aesthetics of performing arts, the proposed theoretical model will be based on previous research about empirical cross-cultural aesthetics of visual arts. We hypothesise that different cultures have different preferences which are mediated by cultural values. Preference will be mediated by cultural factors, when watching different aesthetic features that are similar in terms of movement feasibility.

The present research will focus on aesthetic judgement, not on the “felt” aesthetic experience (Christensen, Pollick, Lambrechts, & Gomila, 2016), because aesthetic judgements can be studied with both the method and production and the method of choice. By focusing on aesthetic judgements, it is possible to compare

findings from both methods. In contrast, “felt” aesthetic experience can be studied with the method of choice only, for example, by presenting a visual stimulus to participants and measuring their affective responses. Also, technical judgements about dance will be excluded, because those are more relevant for expert observers (Bronner & Shippen, 2015). The present research main interest is to study non-experts because, in that way, findings are more generalisable to a wider population.

1.4.5 General Theoretical Predictions

In line with the neurocognitive model of aesthetic appreciation in the performing arts (Orgs et al., 2016), it is expected that fluency will predict preference when comparing feasible/familiar movements against unfeasible/unfamiliar movements. Feasible/familiar movements will be preferred over unfeasible/unfamiliar movements. Specifically, smooth, symmetrical movements will be preferred over abrupt, asymmetrical movements. Smooth movements performed in synchrony or in asynchrony will be preferred over abrupt movements performed in synchrony or in asynchrony. Human body movement (familiar) will be preferred over non-human movement (unfamiliar).

Also, according to our proposed cultural model, it is expected that cultural values will predict aesthetic preference when comparing different types of feasible movements. Western cultures will prefer asynchronous movement because it is hypothesised that asynchrony is in line with individualistic values. Eastern cultures will prefer synchronous movement because it is hypothesised that synchrony is in line with collectivistic values.

The next sections will cover the conceptual framework for developing the method of production, for studying movement feasibility, and for proposing a theoretical model about cross-cultural aesthetics of synchronous movement appreciation.

1.4.6 From the Method of Choice to the Method of Production: The Card Sorting Technique

As mentioned before, in the method of choice, Apparent Biological Motion (ABM) has been used to study aesthetic preference for human movement (Orgs, Bestmann, Schuur, & Haggard, 2011). ABM is the presentation of a sequence of static images depicting different postures of human bodies, which results in the perception of apparent movement and a subjective perception of the duration of the movements (Orgs et al., 2011).

To make the transition from the method of choice to the method of production (see table 1.1), the present study proposes an adaptation of the card sorting technique. Traditionally, the card sorting technique consists of using different cards with different printed concepts or images that must be organised or grouped into categories (Nurmuliani, Zowghi, & Williams, 2004; Rugg & McGeorge, 1997). In this case, the card sorting technique works with the same basic principles of ABM but with an inverse logic: While ABM presents sequences of images previously arranged by the experimenter, the adaptation of the card sorting technique would present the same images to the participants without any predefined order and the participant would be the person in charge of arranging the cards. The aim is to allow participants to create a basic “choreography” of posture sequences and assess the spontaneous use of compositional rules and movement fluency (Orgs et al., 2013). In this way, the present study would address a conceptual gap and a methodological gap found in the current literature: The conceptual gap on preference for movement feasibility and the methodological gap of applying the method of production to the field of human movement aesthetics.

In addition to the neurocognitive model of dance appreciation (Orgs et al., 2016), the mirror model of art (Tinio, 2013) let us expect congruency between results from the method of production and from the method of choice. According to the mirror model, aesthetic production and aesthetic perception share the same cognitive stages, but in inverse order. While aesthetic production starts with the ideation of general notions about the aesthetic object that will be created and finishes with the production of its concrete aesthetic features, aesthetic perception starts with the observation of concrete aesthetic features and finishes with the

ideation of general notions about the aesthetic object. As noted by Tinio (2013), other models about artistic experience, such as the ones proposed by Chatterjee (2003), Koelsch and Siebel (2005), Leder, Belke, Oeberst, and Augustin (2004), and Tinio and Leder (2009), emphasise the aesthetic perception component only. However, despite the mirror model is grounded in the visual arts, it emphasises the complementary nature of creation and perception, which explicitly matches our research questions that compare the method of production and the method of choice.

Table 1.1. Comparison between the method of choice and the method of production.

Method	Independent Variable	Dependent Variable
Method of choice (applied in studies 3, 4, and 5)	Aesthetic features present in video animations and dance video clips created by the researcher: movement features (feasibility/continuation, synchrony), imagery (abstract/human body video animations)	Participant's aesthetic judgement (e.g. like, dislike)
Method of production (applied in studies 1 and 2)	Aesthetic categories (like, dislike, interesting) prompted by the researcher and visual features of materials given to the participant (abstract images/human body postures printed on cards)	Aesthetic features produced by participant (movement feasibility/continuation and symmetry)

1.4.7 Movement Feasibility, Smoothness, and Aesthetic Perception of Human Movement

Aesthetic perception is related to the descriptive processes, which focus on objective aspects of the stimuli (Jacobsen & Höfel, 2003). For abstract visual shapes, these properties include symmetry, balance (Chen, Wu, & Wu, 2011; McManus, Stöver, Kim, & 2011; Wilson & Chatterjee, 2005) and gestalt laws such as "good continuation" (Arnheim, 1974). In the case of meaningful and animate objects, visual aesthetics also depend on semantic association and ecological constraints (Palmer, Schloss, & Sammartino, 2012; Sammartino & Palmer, 2012).

From an evolutionary perspective, there is a link between human perception and human motion that hints towards hypothesising an aesthetic preference for watching smooth human movements. This is the link between the adaptive value of being able to perform smooth movements and being able to perceive smooth movements. On one hand, human body has evolved to move in certain ways responding to physical constraints, such as gravity, obeying physical laws (e.g. two-thirds power law, Catavitello, Ivanenko, Lacquaniti, & Viviani, 2016; Viviani & Schneider, 1991). According to the minimum-jerk model hypothesis (Flash & Hogan, 1985; Viviani & Flash, 1995), smooth motion permits the optimisation of energy use to perform movements under such physical constraints. On the other hand, human visual cognition has evolved to detect and recognise biological motion faster than non-biological motion (Grossman & Blake, 2002; Hiris, 2007; Neri, Morrone, & Burr, 1998; Poom & Olsson, 2002; Pyles, Garcia, Hoffman, & Grossman, 2007; Simion, Regolin, & Bulf, 2008). Since smooth movements are biological, they should be easier to process, and therefore, more aesthetically pleasant than non-biological abrupt movements, at least, for novices adopting a low cognitive effort strategy of aesthetic appreciation.

Movement smoothness relates to the feasibility of performing a movement and to the predictability of how movement progresses, in loose analogy to the Gestalt law of good continuation (Arnheim, 1974; Koffka, 1935; Wertheimer, 1923/1938). Importantly, the ability to perform an observed movement determines the way in which it is visually perceived (Aglioti, Cesari, Romani, & Urgesi, 2008; Calvo-Merino et al., 2006; Orgs et al., 2008). This happens due to the activation of

the so called “mirror neuron system”, sensorimotor brain areas that are activated while observing movements that are executed by another subject, but only if these movements can be actually performed by the observer (di Pellegrino, Fadiga, Fogassi, Gallese & Rizzolatti, 1992; Gallese et al.,1996). Therefore, the perception of movement can involve activation in both visual and motor areas of the brain. This idea is engrained in the more general notion of motor resonance (Gallese, 2003), which means that there is a convergence between the psychological processes employed for action execution and action perception, specifically observed in the activation of the mirror neuron system.

For static body postures feasibility of a position may influence the aesthetic perception of the observer (Cross, Mackie, Wolford, & Hamilton, 2010). For instance, a neuroimaging study by Cross et al. (2010) found that extrastriate body areas (EBA) and fusiform body areas (FBA) showed more activation when perceiving contorted postures (low feasibility) in comparison to ordinary postures (high feasibility). This means that different brain areas respond in different ways to specific aesthetic features, for example, when observing feasible or unfeasible human postures. Cross et al. (2011) found that there is a preference for movements with low feasibility or complex movements that are less feasible and more interesting to observe. Other studies however report a preference for familiar and feasible movements or postures (Beilock & Holt, 2007; Kirsch et al., 2015; Kirsch et al., 2013; Topolinski, 2010).

It is therefore unclear how perceived movement feasibility relates to movement preference, since some studies argue that feasible movements are preferred, while other studies claim that unfeasible movements are preferred. These inconsistent findings from previous research still make valid to propose the question: Do we like watching movements that we can do or movements that we cannot do?

To summarise, aesthetic appreciation of body posture sequences should depend on implied movement fluency. Also, it would be assumed that the preference for such postures and movements differ as well, considering that the feasibility of the perceived postures and movements is one of the factors that influence aesthetic preference (Cross et al., 2011; Kirsch et al., 2015; Kirsch et al., 2013). It is likely to find differences in the behavioural responses related to the preference of movement feasibility.

1.4.7.1 Aesthetic perception of human movement across cultures.

Across all cultures people dance. Yet, despite its universal nature, functions and definitions, dance vastly differ between societies and range from religious rituals to recreational entertainment (Hanna, 1987). Despite a growing interest in an experimental aesthetics of movement and dance (Christensen et al., 2016; Jola et al., 2014; Kirsch et al., 2015; Orgs et al., 2013) the influence of cultural background on aesthetic perception of dance has not been studied experimentally.

Previous studies have found that Western and Eastern societies differ in their aesthetic appreciation of abstract shapes (Kim & Marcus, 1999), and landscape and portrait drawings (Masuda, Gonzalez, Kwan, & Nisbett, 2008). These culturally specific preferences have been linked to differences in attentional focus between Western and Eastern cultures (Masuda et al., 2008). While participants from Western cultures focus on specific objects and their details present in the visual display (analytic perception), participants from Eastern cultures tend to perceive a group of objects 'holistically' in close relation to its visual context (holistic perception) (Masuda & Nisbett, 2001; Miyamoto, Nisbett, & Masuda, 2006).

Eastern and Western cultures have also been reported to differ in various cultural dimensions, especially along collectivistic and individualistic cultural values. Collectivistic cultures focus on the interactions with others prioritising the common interests and needs of the group. Most of the Eastern societies (e.g. Japan, China, and South Korea) are described as collectivistic, but this characterisation also extends to many other countries in Latin America and Africa. Individualistic cultures give priority to the interests and needs of the individual, and most of the Western societies (e.g. United States, United Kingdom and other countries from Western Europe) are characterised as individualistic, (Hofstede, 1984, 2001; Hofstede, Hofstede, & Minkov, 2010; Triandis, 1995).

Conceivably, individualist and collectivist cultural orientation and attentional focus are understood to be strongly linked (Varnum, Grossmann, Kitayama, & Nisbett, 2010). People in individualistic cultures reportedly favour an analytic perceptual style, focussing on specific objects in the foreground, (e.g., Masuda et al., 2008), which reflects individualistic emphasis on personal agency and its distinctiveness. In contrast, collectivistic cultures often exhibit a holistic perceptual

and appreciation style, focussing on contextual information and the entire scene (Masuda et al., 2008; Nisbett, 2003), which resonates with collectivistic emphasis on group harmony and sensitivity to social contexts. Various within-nation studies also reported that holistic perceptual style was prominent in collectivistic communities and regions whereas analytic perceptual style was prominent in individualistic communities and regions (Kitayama, Ishii, Imada, Takemura, & Ramaswamy, 2006; Knight & Nisbett, 2007; Uskul, Kitayama, & Nisbett, 2008). Additionally, Western societies prefer highly arousing experiences (e.g., excitement) while Eastern societies prefer low arousal experiences (e.g., calmness) (Tsai, Louie, Chen, & Uchida, 2007). More specifically, traditional Japanese aesthetics have been characterised by a preference for simple aesthetic objects, often with negative emotions, such as sadness (Keene, as cited in Odin, 2016; Odin, 2016).

1.4.7.2 Culture and aesthetic perception of synchronous human movement.

In the cross-cultural experiment (study 5), we will examine for the first time whether cultural differences also influence aesthetic appreciation of the performing arts, and specifically dancing in groups. Synchronous or unison movement is an important feature of dance choreography and with clear links to social interaction and transmission of cultural values (Flinn, 1997). For example, moving in synchrony increases group affiliation (Reddish et al., 2013) and cooperation between group members (Wiltermuth & Heath, 2009). Synchrony even increases pain thresholds of performers (Tarr, Launay, Cohen, & Dunbar, 2015). Watching other people behave in synchrony also communicates group cohesion to spectators (Eskenazi, Rueschemeyer, de Lange, Knoblich, & Sebanz, 2015; Lakens & Stel, 2011). Movement synchrony is therefore relevant to cultural values associated with group affiliation, including its positive connotations such as high levels of cooperation and similarity between group members (Emswiller, Deaux, & Willits, 1971; Gaertner & Bickman, 1971; Sherif, Harvey, White, Hood, & Sherif, 1961) but also its negative connotations, such as conformity and in-group/out-group bias (Asch, 1951; Tajfel, Billig, Bundy, & Flament, 1971). Dancing in synchrony has prosocial effects that might well appeal to collectivist aesthetics. Moreover, synchronous movement is

likely to favour a holistic perceptual style, as individual performers are perceptually bound into groups by gestalt laws of common fate, good continuation and similarity (Arnheim, 1974; Koffka, 1935; Orgs et al., 2013; Wertheimer, 1923/1938). In contrast, asynchronous movement should favour an analytic perceptual focus on individual dancers. Indeed, collectivistic cultures prefer visual stimuli associated to conformity and harmony, whereas individualistic cultures tend to prefer visual uniqueness (Kim & Markus, 1999). We propose that asynchronous dance should artistically represent typical Western individualistic values such as the independence and uniqueness of each individual in relation to the group. In contrast, collectivistic values may be more readily represented in synchronous dance, with its focus on interdependence of group members and conformity, and similarity (Lakens & Stel, 2011).

Considering these previous findings and theoretical implications, the cross-cultural experiment (study 5) will compare British and Japanese participants, the former representing an individualistic and analytic perceptual group and the latter representing a collectivistic and holistic perceptual group. We predict that British participants would prefer asynchronous dance and the aesthetic features associated to asynchronous dance while Japanese participants would prefer synchronous dance. Moreover, if cultural differences in attentional focus are related to differences in collectivist and individualist cultural orientations, aesthetic perception for movement synchrony should be explained by individual differences in collectivism/individualism and need for uniqueness/conformity, and sensation seeking tendencies. Aesthetic preference for asynchronous dance in British participants may be mediated by individualism, need for uniqueness, sensation seeking. Aesthetic preference for synchronous dance in Japanese participants should be mediated by collectivism and conformity (see figure 1.2).

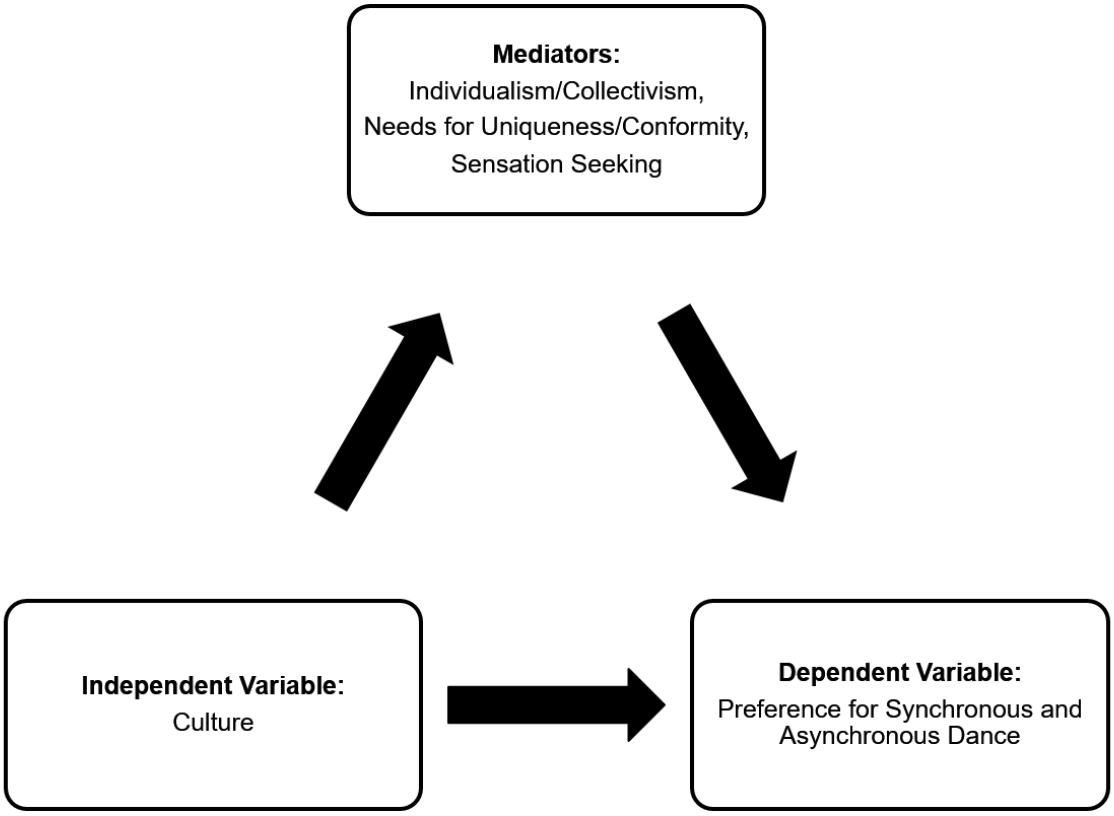

Figure 1.2. Theoretical model (adapted from Kahle, 2014).

This theoretical model (figure 1.2) is an adaptation from Kahle (2014). In that unpublished MSc dissertation, it was proposed that participants from individualistic (USA) and collectivistic (India) countries would differ in their aesthetic perception of solo, synchronous, and asynchronous dance. That study proposed that US participants would prefer solo and asynchronous dance, while Indian participants would prefer synchronous dance. Nevertheless, that hypothesis was not supported. There, it was found that participants from both cultural groups preferred synchronous dance, possibly due to methodological limitations. For instance, that cross-cultural experiment suggested that Indian participants were not as collectivistic as expected, and it did not control whether US respondents were first or second-generation participants living in the country (from both parents born and raised in USA), to assure north American cultural immersion.

For those reasons, we propose the comparison of second-generation participants from an individualistic culture (UK) against participants from one of the most typically collectivistic cultures (Japan). These methodological differences will be explained in more detail in study 5.

CHAPTER 2

STUDY 1: AESTHETIC PREFERENCE FOR SYMMETRY AND GOOD CONTINUATION WHEN CONSIDERING IMPLIED MOTION

2.1 Introduction

The present experiment applies for the first time the method of production to the study of human motion psycho-aesthetics. As seen in the general introduction, the method of production has some advantages over the method of choice. For instance, one of the main advantages of the method of production is that it overcomes researcher's biases towards the creation of stimuli that will be presented to participants, which may happen in the method of choice. Instead, in the method of production, participants create their own stimuli, showing their preferences under different instructions. Here, in study 1, we will ask participants to produce sequences of static images that they would like to see or that they would consider interesting to see. After they produce the sequences, we will measure its continuation and symmetry to determine whether participants like or interest symmetrical sequences and sequences with good continuation.

Symmetry and continuation are relevant aesthetic features for our experiment because they are related to visual fluency. They are linked to visual fluency because symmetry and good continuation require less cognitive effort to process the information in comparison to asymmetry and bad continuation (Orgs et al., 2013; Reber et al., 2004). Therefore, these aesthetic features are helpful to test the neurocognitive model of dance appreciation (Orgs et al., 2016).

Image symmetry is a visual reflection, a graphic reproduction displayed on the opposite of the reproduced pattern. For example, watching a pattern with vertical symmetry requires processing less information, because it has more redundancy, the left side of the display contains the same information as the right side (Berlyne, 1972; Reber et al., 2004). It is like watching an object reflected in a mirror. If we consider different hierarchical levels of a composition (Orgs et al., 2013), symmetry can be local or global. These hierarchical levels help us to analyse effects of specific features of human movement. For instance, we can test whether a choreography is

liked due to its isolated postures or due to the transition between some postures. Therefore, it is useful to measure local and global symmetry to assess their role in observer's aesthetic preference.

Local symmetry is at the dynamic level (Orgs et al., 2013), in the specific transition between postures, as in the example above about an object in front of a mirror. Global symmetry is at the structural level (Orgs et al., 2013), in the visual balance between distant postures of a sequence of movements. For instance, starting a sequence of moves from left to right by stretching the body to the left, then standing straight up, and then finishing by stretching the body to the right. In this case, the first and the last position is one example of global symmetry. We can say it is a symmetrical sequence because there is a reflection, a balance, between the movements to the left and the movements to the right, they are basically the same movements performed at the same pace, the only difference is in orientation and time: to the left or to the right, and when the movement was performed, at the beginning or at the end of the sequence.

In the context of dance, good continuation refers to the smooth transition between one posture and the next one. Continuation in static images has been described by the gestalt principle of "good continuation", which states that images going in the same direction or in the same sequence or order tend to be perceived as part of the same group or as part of the same object (Arnheim, 1974; Koffka, 1935; Orgs et al., 2013; Wertheimer, 1923/1938). In this case, similar sequential postures should be perceived as part of the same sequence. Again, we need to study this because sequences with good continuation are more predictable and easier to process visually.

Another factor we will consider is whether the cards depict human body or non-human shapes. As described in the general introduction, some studies have found a link between embodied cognition and aesthetic preference for watching familiar movements (Kirsch et al., 2015; Kirsch et al., 2013). In this case, when observing a sequence of implied motion made with human body images and a sequence produced with abstract shapes and images of objects, in line with the embodied cognition framework (Glenberg & Kaschak, 2002; Glenberg et al., 2008) and the notion of motor resonance (Gallese, 2003), we would expect participants

could relate their own body movements to the implied motion of another human body, but it would be less probable to relate them to sequences of abstract shapes and non-human images. We would expect this to occur in our studies that will apply the method of production (as here in study 1), and the method of choice.

In addition, since observers' level of artistic expertise may influence their aesthetic appreciation (Furnham & Walker, 2001; Hekkert & van Wieringen,1996; Illes, 2008; Pihko et al., 2011; Uusitalo, Simola, & Kuisma, 2009), we will collect information from participant's educational and artistic background to characterise whether they are novices in artistic domains.

As seen in the general introduction, based on the neurocognitive model of dance appreciation (Orgs et al., 2016), the present study hypothesises that "good continuation" (in line with good continuation of visual gestalts) and symmetrical sequences will be preferred over "bad continuation" and asymmetrical sequences. In line with the neurocognitive model, we will ask participants to arrange sequences in a way they like or they consider interesting to see.

Since in everyday life "like" implies a positive valence and pleasure, the like condition should induce appreciation of fluency while the interesting condition should induce appreciation of arousal because interesting, at least in theory, implies something that catches the attention of the observer but that not necessarily implies pleasure (Earle, 2012). In addition, like and interesting correspond to different dimensions of the aesthetic experience. Liking corresponds to the evaluative dimension of aesthetic judgement. Interestingness corresponds to the dimension of arousal or intensity, which is related to judgements about stimulus information (Berlyne, 1974; Orgs et al., 2016). Therefore, it is hypothesised that under the like condition high fluency will be preferred and under the interesting condition low fluency will be preferred. This expected difference between liking and interestingness should be reflected in sorting duration as well: the interesting condition should take longer than the like condition, since analytical processing should require more cognitive effort (Orgs et al., 2016).

It is hypothesised that the order of "choreographed" sequences will differ between body postures and inanimate and abstract control stimuli, since the latter

are not constrained by human movement feasibility. It would be more difficult to associate objects or abstract images to the own body movements.

Hypothesis 1. Participants will produce sequences with higher global symmetry and good continuation for the like condition.

Hypothesis 2. Participants will produce sequences with local symmetry and lower continuation for the interesting condition.

Hypothesis 3. Participants will produce higher continuation and symmetry for body sequences than for inanimate sequences.

2.2 Methods

2.2.1 Participants

Based on the demographic data participants can be characterised as non-experts in the domain of arts. The sample consisted of 28 Brunel University students (25 female). 25 undergraduate students were recruited through the online participant pool system of Brunel University London. The other 4 students were contacted through referral sampling. The mean age was 19 years (age range = 18 – 27 years). 26 first year Psychology students received credits for their participation. 17 participants had British nationality. The rest were international students from Europe, Asia and Africa. 7 participants had not received any kind of artistic education in the past. None of the participants reported art training at a professional level, 7 received art classes during their childhood, 8 at a recreational/exercise level and 6 at a vocational/teaching level. The artistic domains of training were performing arts (n = 11), visual arts (n = 8) and music (n = 2). Last time participants took art classes, in years (M = 4.38, SD = 4.17). Years taking art classes (M = 3.64, SD = 2.65), number of annual visits to museums (M = 2.89, SD = 4.54), times per year to watch performances (M = 4.6, SD = 8.63).

2.2.2 Procedure

An adaptation of the card sorting technique was applied during the experiment. Participants sorted printed cards according their preference in sets of images that they would like to see and in sets of images that they would consider interesting following the indications given by the researcher. It was clarified that there were no right or wrong answer, and that it depended on their own criteria.

The procedure was repeated with different sets of images. There were 4 decks of cards: abstract images, scissors, corkscrews and body postures. The posture images were similar to those used by Orgs et al. (2013). Each deck consisted of 12 cards, each one depicting a different position of the same object (see figures 2.1 and 2.2). If arranged in the correct order the cards could represent a sequence of movement of determine object. For example, the implied motion of opening or closing scissors. At the end of the sorting, the arranged cards would resemble a simplified version of a storyboard as used in animation.

Participants had up to 5 minutes per sorting but they were encouraged to use less time if necessary. After sorting each group of cards, participants informed the researcher about it in order to register the sorting duration using a stopwatch and then to photograph the results and continue with the next set of cards.

Participants took into account the following instructions (see appendix 2):

1. See a set of 12 cards.
2. Choose 7 cards.
3. Sort the selected images in a set of 7 cards.
4. Each set must contain 7 cards.
5. The set of the selected cards must be arranged horizontally, from left to right.

Participants received an information sheet accompanied by a verbal explanation of the experiment before signing a consent form. Then they read an instruction page and asked questions if necessary. To validate the information, the experimenter briefly explained the procedure. Later, the cards were showed and the participant started the sorting procedure. The duration of each sorting was registered with a chronometer and a photograph of the arranged cards was taken by the researcher. Then, the experimenter shuffled the cards and then repeated the

process for the “like” or “interesting” condition with each deck of cards, which was randomised (see table 2.1). After the sorting procedure, participants answered a brief questionnaire and were debriefed. The five studies in the present thesis were approved by the ethical committee at Brunel University London (see appendix 1).

Table 2.1. Example of the randomisation between the conditions “like” and “interesting” for one of the participants.

Abstract	**Scissors**	**Corkscrew**	**Postures**
like	interesting	interesting	like
interesting	like	like	interesting

2.2.3 Measures

2.2.3.1 Global symmetry.

Mirrored images in distant pairs of cards. The first with the last, the second with the penultimate and the third with the antepenultimate (phrase structure grammar in Bahlmann, Gunter & Friederici, 2006). It was scored from 0 to 3. Each pair of cards with global symmetry scored 1 point.

2.2.3.2 Local symmetry.

Mirrored images closed together one next to each other (finite state grammar in Bahlmann et al., 2006). It was scored from 0 to 3. Each pair of cards with local symmetry scored 1 point.

2.2.3.3 Continuation.

How similar are the images that are together, how is the implied motion transition from one image to the next one (in line with Orgs et al. 2013). It was scored from 0 to 6. Each pair of cards with “good” continuation scored 1 point.

2.2.3.4 Background questionnaire.

The performing arts background questionnaire was adapted from “The Watching Dance Project” (n.d.) and asked demographic information, artistic background, criteria for sorting the cards, if they found a difference between like and interesting, and favourite set of cards.

The scoring of symmetry and continuation was done manually based on the sorting photographs after these were cropped and printed. Each sorting photograph was compared to a reference pattern with the highest symmetry and continuation. The scoring procedure was performed twice in order to double check its results.

2.2.4 Research Design

4 x 2 experimental design with related data (a repeated measures design). 4 sets of images and 2 counterbalanced sorting per set: like to see and interesting to see. Therefore, each participant completed 8 sortings in total. The image condition order was fixed because they were presented from the most abstract to the most concrete reference to the human body. All images resembled a human body in terms of head,

trunk and limbs in the followed order, from abstract to concrete: 1) abstract images, 2) scissors, 3) corkscrew and 4) body posture. In this way, the abstract images were a control stimulus because presenting them at the beginning of the procedure limited its potential reference to the human body. The opposite would happen if presenting the abstract images at the end of the procedure: increasing its reference to the human body.

The order of the instruction “images that you would like to see” and “images that you would consider interesting to see” was randomised to counterbalance the sorting under the “like” condition before the “interesting” condition, or vice versa (see table 2.2).

Table 2.2. Experimental design.

		Condition: images (fixed order)			
		Abstract	**Scissors**	**Corkscrew**	**Body Postures**
Condition: indications (counterbalanced)	**Sequences that you would <u>like</u> to see**	Abstract images that you would like to see	Scissor images that you would like to see	Corkscrew images that you would like to see	Body posture images that you would like to see
	Sequences that you would consider <u>interesting</u> to see	Abstract images that you would consider interesting to see	Scissor images that you would consider interesting to see	Corkscrew images that you would consider interesting to see	Body posture images that you would consider interesting to see

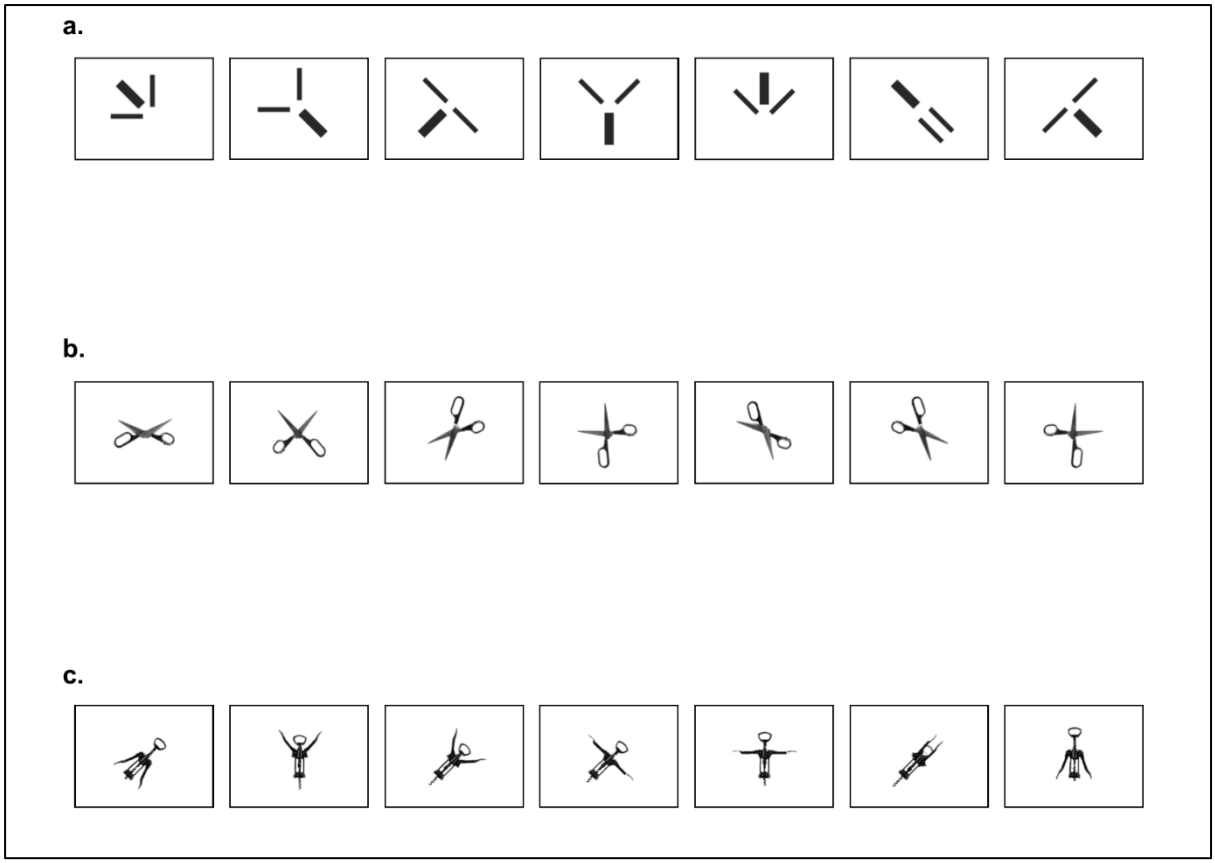

Figure 2.1. Example of abstract, scissors and corkscrew cards. Figure 2.1 illustrates a digital reproduction of the actual sorting produced by different participants: a. abstract (produced for the liked condition), b. scissors (produced for the interesting condition), c. corkscrew (produced for the interesting condition).

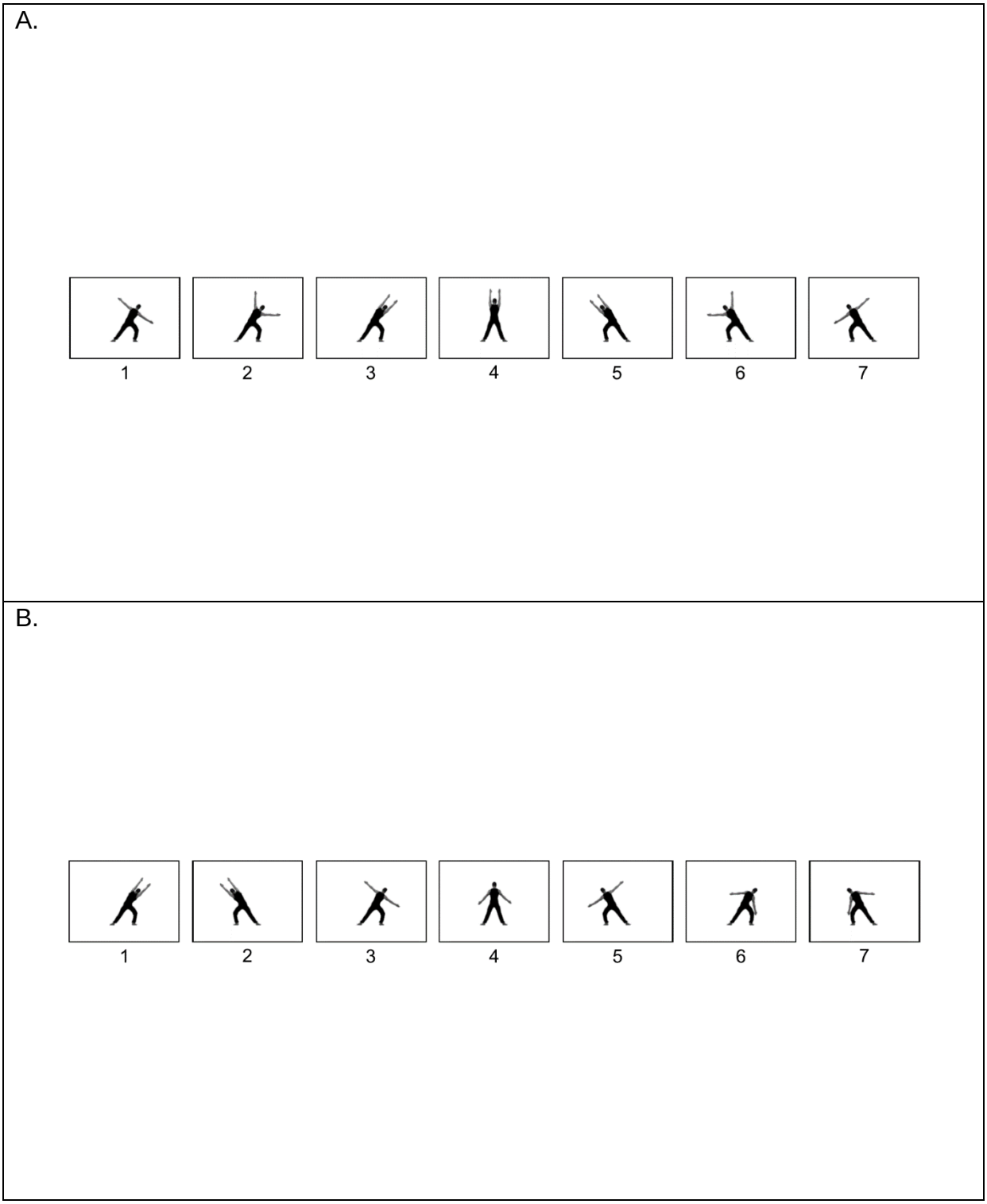

Figure 2.2. Example of body posture symmetry and continuation. Figure 2.2 depicts a digital reproduction of the actual sorting produced by different participants regarding the interesting condition. **A.** illustrates global symmetry between cards 1 and 7, 2 and 6, 3 and 5. Also, **A.** shows good continuation between cards 1 and 2, 2 and 3, 3 and 4, 4 and 5, 5 and 6, 6 and 7. **B.** example of local symmetry between the cards 1 and 2, 6 and 7.

2.3 Results

2.3.1 Comparison across Images: Abstract, Scissors, Corkscrew, and Body Postures

In order to test whether participants produced higher symmetry and continuation when sorting body sequences in comparison to inanimate sequences, we compared the numerical scores across images. Since data had a non-normal distribution, a non-parametric test was selected. In this case, a Friedman's ANOVA was applied to compare scores across images.

Since we are testing directional hypotheses, the results reported in the present study are one-tailed. A Friedman's ANOVA did not show a significant difference among abstract images, scissors, corkscrew and postures regarding global symmetry (χ^2 (3) = 1.77, p > .05), local symmetry (χ^2 (3) = 4.69, p > .05) and continuation (χ^2 (3) = 6.77, p > .05) under the "like" condition. The same happens for the "interesting" condition regarding global symmetry (χ^2 (3) = 1.05, p > .05) and local symmetry (χ^2 (3) = 2.73, p > .05) with the exception of continuation (χ^2 (3) = 10.32, p < .05), which showed a significant difference among the different images. A Wilcoxon Signed-Rank post hoc test, with a Bonferroni correction (level of significance 0.0083), showed that scissors continuation scores were significantly higher than abstract continuation scores (T = 35.50, r = -0.33) and that corkscrew continuation was significantly higher than abstract continuation as well (T = 34, r = -0.36).

2.3.2 Comparison between Indications: Sequences that you would Like to See Vs Images that you would Consider Interesting to See

To test whether participants produced sequences with higher global symmetry and good continuation for the like condition, we compared the scores between like and interesting conditions on each of the aesthetic features. Since data were non-normally distributed, a non-parametric test was selected. Thus, a Wilcoxon signed-rank test was applied.

A Wilcoxon signed-rank test compared the scores between like and interesting on each of the aesthetic features. None of the comparisons showed a

significant difference. Liked abstract global symmetry (*Mdn* = 0) compared to interesting abstract global symmetry (*Mdn* = 0), T = 33, $p > 0.05$; liked abstract local symmetry (*Mdn* = 0) compared to interesting abstract local symmetry (*Mdn* = 0), T = 20.50, $p > 0.05$; liked abstract continuation (*Mdn* = 1) compared to interesting abstract continuation (*Mdn* = 1), T = 103.50, $p > 0.05$.

Liked scissors global symmetry (*Mdn* = 0) compared to interesting scissors global symmetry (*Mdn* = 0), T = 5, $p > 0.05$; liked scissors local symmetry (*Mdn* = 0) compared to interesting scissors local symmetry (*Mdn* = 0), T = 16, $p > 0.05$; liked scissors continuation (*Mdn* = *2*) compared to interesting scissors continuation (*Mdn* = 1), T = 65.50, $p > 0.05$.

Liked corkscrew global symmetry (*Mdn* = 0) compared to interesting corkscrew global symmetry (*Mdn* = 0), T = 5, $p > 0.05$; liked corkscrew local symmetry (*Mdn* = 0) compared to interesting corkscrew local symmetry (*Mdn* = 0), T = 16, $p > 0.05$; liked corkscrew continuation (*Mdn* = 1) compared to interesting corkscrew continuation (*Mdn* = 2), T = 59.50, $p > 0.05$.

Liked posture global symmetry (*Mdn* = 0) compared to interesting corkscrew posture symmetry (*Mdn* = 0), T = 20.50, $p > 0.05$; liked posture local symmetry (*Mdn* = 0) compared to interesting posture local symmetry (*Mdn* = 0), T = 26, $p > 0.05$; liked posture continuation (*Mdn* = 2) compared to interesting posture continuation (*Mdn* = 1), T = 86.50, $p > 0.05$.

2.3.3 Sorting Duration

In order to test whether sorting duration significantly varied across conditions, we compared the durations across images and between conditions. Since data were non-normally distributed, we selected non-parametric tests. For the comparisons across images, Friedman's ANOVA was used. For comparisons between conditions (like/interesting), Wilcoxon signed-rank test was used.

A Friedman's ANOVA showed a significant difference among the sorting duration across images regarding the indications of "like" (χ^2 (3) = 10.09, $p < .05$) and "interesting" (χ^2 (3) = 8.91, $p < .05$). A Wilcoxon post hoc signed-rank test, Bonferroni correction with a critical level of significance of 0.0083, confirmed that under the "like" indication abstract images sorting was significantly longer than

scissors (T = 91, r = -0.34) and body postures (T = 58, r = -0.44). There was no significant difference between the following sorting durations under the “like condition”: abstract and corkscrew (T = 118); scissors and corkscrew (T = 180); scissors and postures (T = 180.50); corkscrew and postures (T = 96).

A Bonferroni correction with a critical level of significance of 0.0083 was applied to the Wilcoxon post hoc signed-rank test. Under the “interesting” condition none of the post hoc comparisons showed a significant difference in sorting durations between the following pairs: abstract and scissors (T = 91.50), abstract and corkscrew (T = 134.50), abstract and postures (T = 114), scissors and corkscrew (T = 188), scissors and postures (T = 177.50), corkscrew and postures (T = 135).

2.3.4 Self-report Measures

Since we did not observe a significant difference between liking and interestingness of the picture sequences, we conducted a separate analysis based on self-report measures. In order to explore whether participants that reported considering implied motion produced higher global symmetry and continuation than participants did not report considering implied motion, we compare two sub-samples based on self-reported responses. Since data were non-normally distributed, non-parametric tests were selected. In this case, a Mann-Whitney U test was used.

2.3.4.1 What were your criteria for arranging the cards? Movement vs without movement.

One of the questions asked in the background questionnaire was: “What were your criteria for arranging the cards?” The responses were classified into two groups: sequence selection based on implied movement (*n* = 9) and sequence selection not based on implied movement (*n* = 19). If the response mentioned words such as action, movement, motion, sequence or order, the response was assigned to the group with movement. If the response did not mention any of those words, it was assigned to the group without movement. The aesthetic production of participants that mentioned a reference to movement as a criterion for arranging the cards was compared to the aesthetic production of participants that did not mention it (see figures 2.3, 2.4, 2.5, 2.6, 2.7, 2.8). A Mann-Whitney U test showed a significant difference, under the “like” indication, for scissors’ continuation (Implied motion *Mdn* = 3.00; No implied motion *Mdn* = 1.00, *U* = 51.50, $p < 0.05$, r = -0.33), corkscrew’s

movement continuation (Implied motion *Mdn* = 3.00; No implied motion *Mdn* = 1.00, *U* = 46, *p* < 0.05, r = -0.38) and corkscrew's global symmetry (Implied motion *Mdn* = 1.00; No implied motion *Mdn* = 0.00, *U* = 40.50, *p* < 0.05, r = -0.58). "Interesting" corkscrew global symmetry had a significant difference as well (Implied motion *Mdn* = 0.00; No implied motion *Mdn* = 0.00, *U* = 63, *p* < 0.05, r = -0.31). Also, body posture images were significantly different regarding local symmetry (Implied motion *Mdn* = 0.00; No implied motion *Mdn* = 0.00, *U* = 45, *p* < 0.05, r = -0.29) and continuation (Implied motion *Mdn* = 2.00; No implied motion *Mdn* = 1.00, *U* = 46.50, *p* < 0.05, r = -0.38), both in the "interesting" condition.

None of the aesthetic features presented significant differences for abstract images: liked abstract global symmetry (*U* = 72.50, *p* > 0.05), liked abstract local symmetry (*U* = 71, *p* > 0.05), liked abstract continuation (*U* = 74, *p* > 0.05), interesting abstract global symmetry (*U* = 65, *p* > 0.05), interesting abstract local symmetry (*U* = 58.50, *p* > 0.05), interesting abstract continuation (*U* = 63.50, *p* > 0.05).

Liked scissors global symmetry (*U* = 81.50, *p* > 0.05), liked scissors local symmetry (*U* = 67.50, *p* > 0.05), interesting scissors global symmetry (*U* = 72, *p* > 0.05), interesting scissors local symmetry (*U* = 85.50, *p* > 0.05), interesting scissors continuation (*U* = 77.50, *p* > 0.05), liked corkscrew local symmetry (*U* = 53, *p* > 0.05), interesting corkscrew local symmetry (*U* = 57.50, *p* > 0.05), interesting corkscrew continuation (*U* = 81, *p* > 0.05), liked posture global symmetry (*U* = 81, *p* > 0.05), liked posture local symmetry (*U* = 69.50, *p* > 0.05), liked posture continuation (*U* = 53.50, *p* > 0.05) and interesting posture global symmetry (*U* = 65, *p* > 0.05) did not show a significant difference.

2.3.4.2 Favourite set of cards.

The favourite set of cards was postures (*n* = 11), followed by corkscrew (*n* = 10), scissors (*n* = 5) and abstract (*n* = 2).

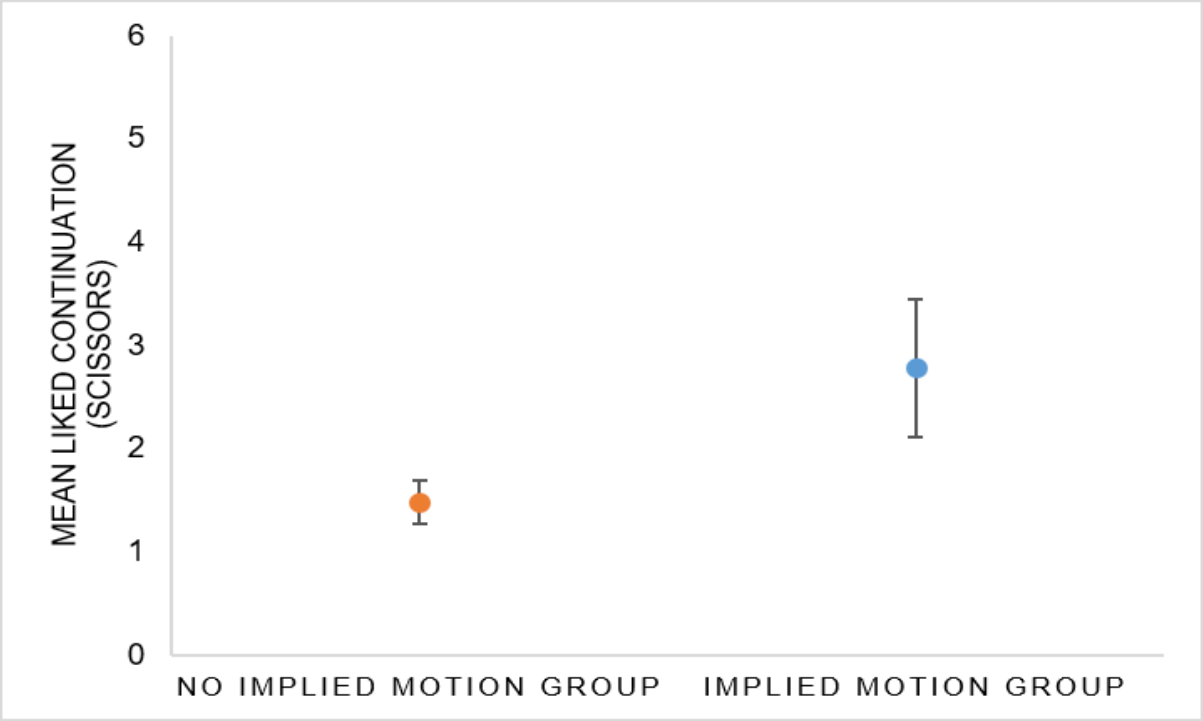

Figure 2.3. Participants that mentioned implied motion as sorting criteria produced higher continuation with scissors for judgements of liking. Point plots indicate mean scores. Error bars represent Standard Error of the Mean (SEM).

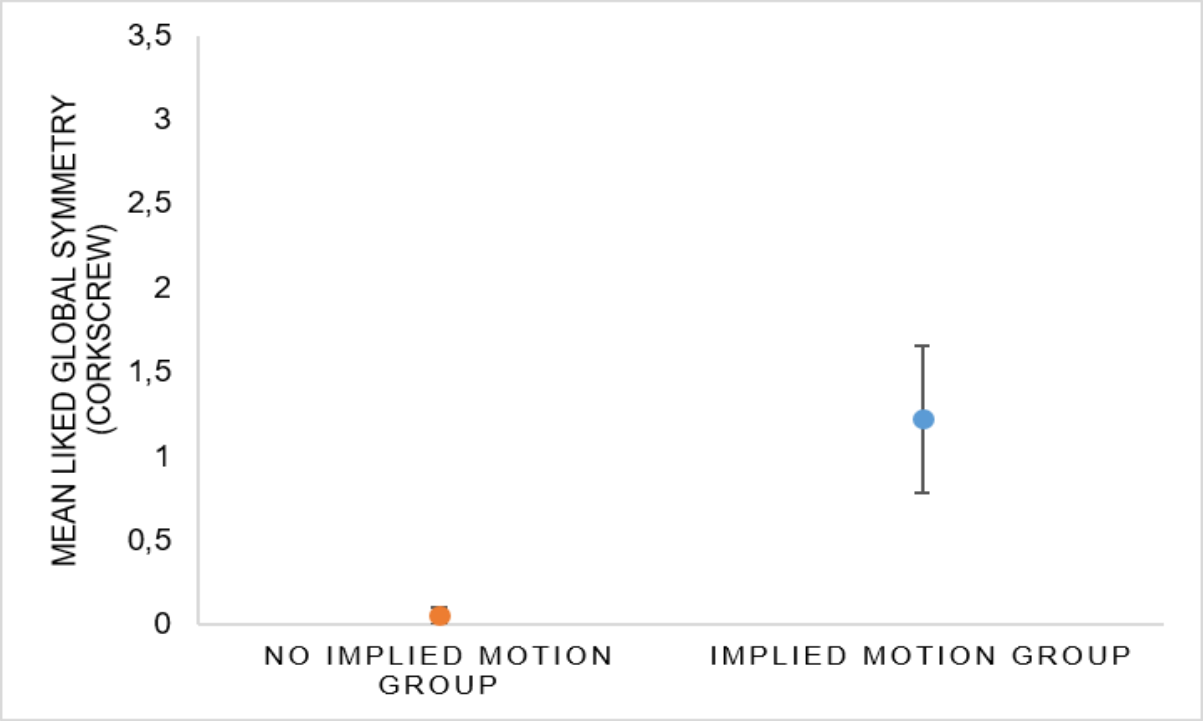

Figure 2.4. Participants that mentioned implied motion as sorting criteria produced higher global symmetry with corkscrews for judgements of liking. Point plots indicate mean scores. Error bars represent SEM.

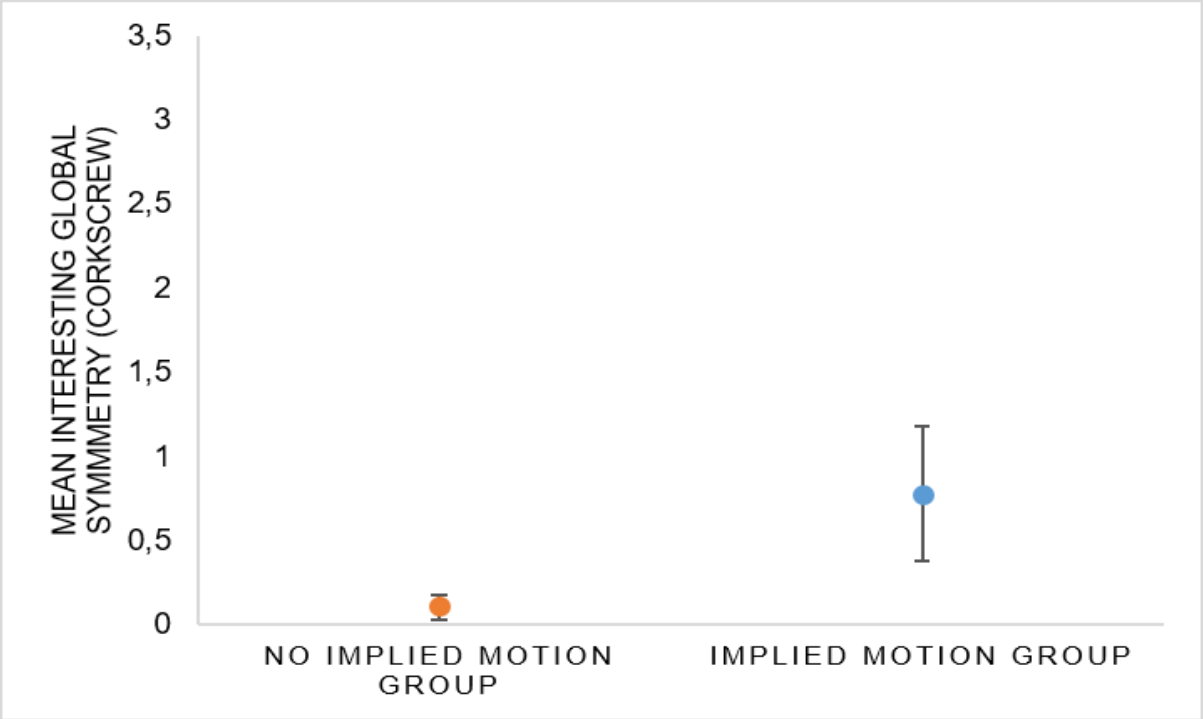

Figure 2.5. Participants that mentioned implied motion as sorting criteria produced higher global symmetry with corkscrews for judgements of interestingness. Point plots indicate mean scores. Error bars represent SEM.

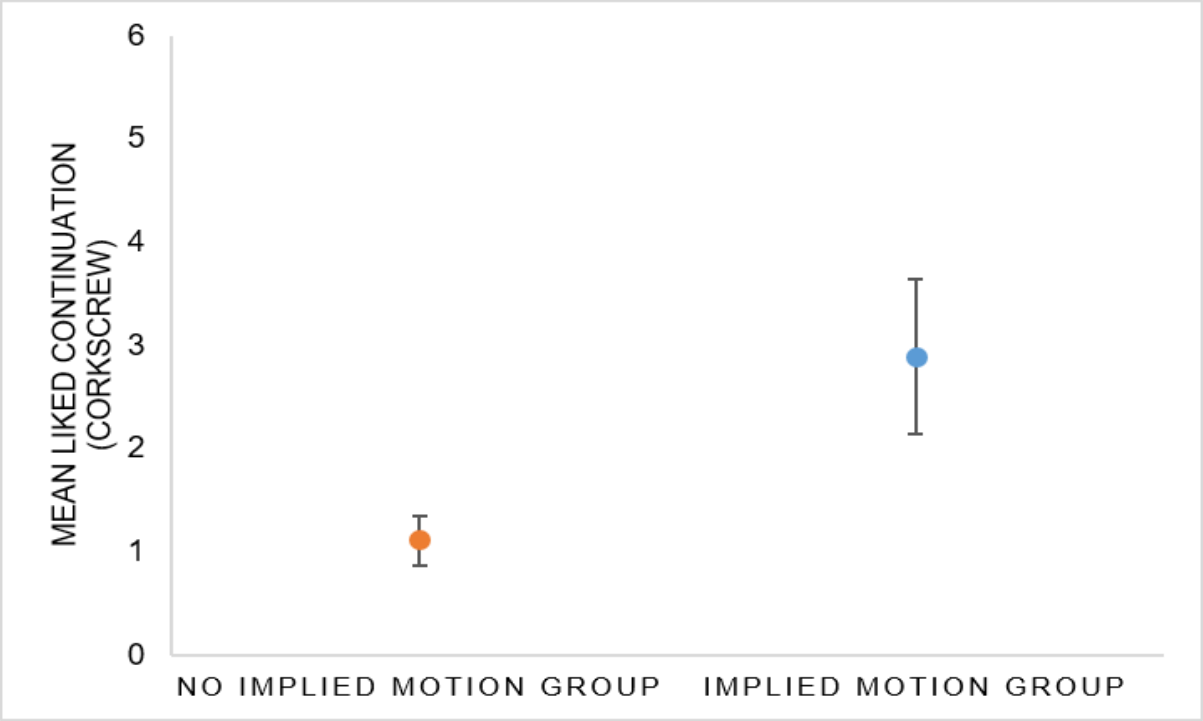

Figure 2.6. Participants that mentioned implied motion as sorting criteria produced higher continuation with corkscrews for judgements of liking. Point plots indicate mean scores. Error bars represent SEM.

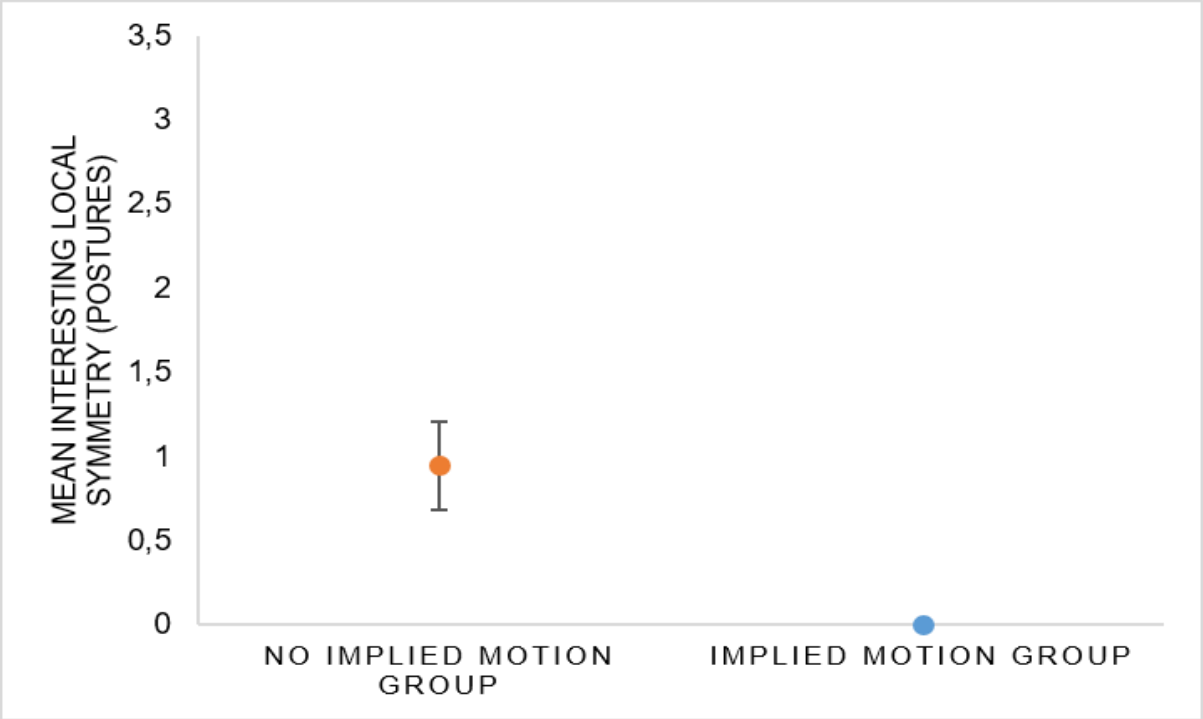

Figure 2.7. Participants that did not mention implied motion as sorting criteria produced higher local symmetry with postures for judgements of interestingness. Point plots indicate mean scores. Error bars represent SEM.

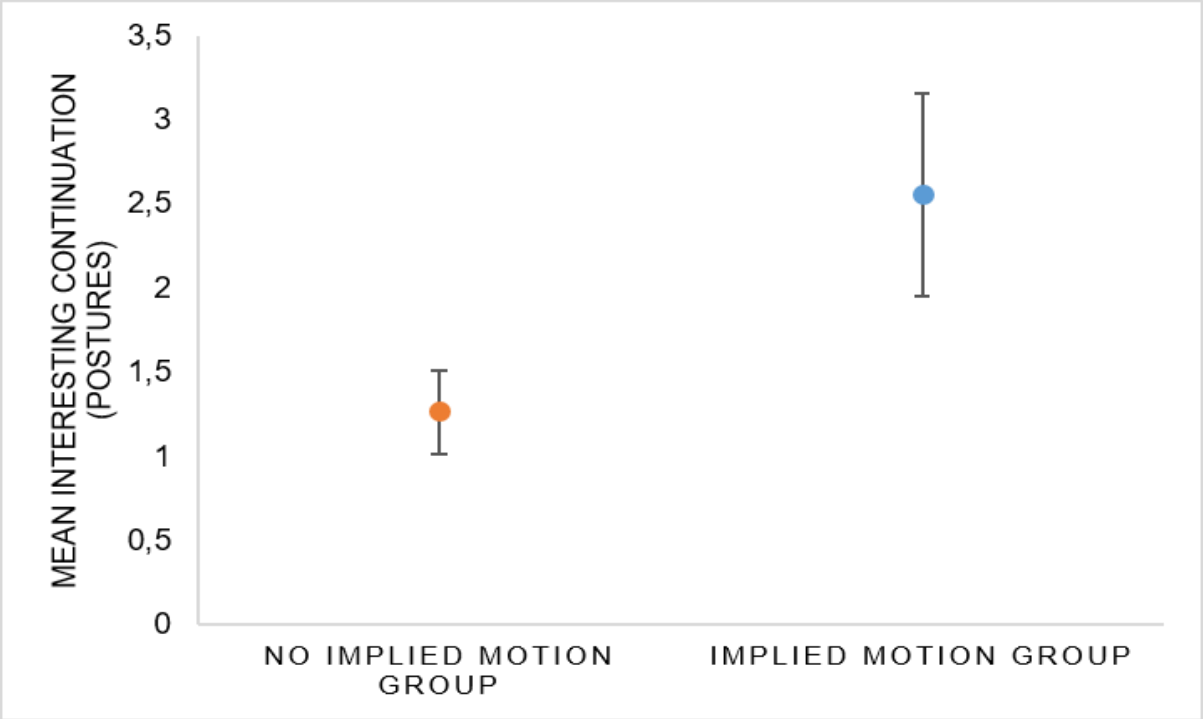

Figure 2.8. Participants that mentioned implied motion as sorting criteria produced higher continuation with postures for judgements of interestingness. Point plots indicate mean scores. Error bars represent SEM.

2.4 Discussion

The purpose of the present study was to address the conceptual gap on preference for movement continuation and the methodological gap of applying the method of production to the field of human movement aesthetics. It compared interestingness and liking among objects and body postures. Analysis was complemented by self-reported information provided in the background questionnaire.

2.4.1 Comparison between Interestingness and Liking

When comparing like versus interesting, it was expected to find higher continuation and global symmetry for the “like” condition and lower scores for “interesting”. Higher symmetry and continuation scores for “like” would support hypothesis 1 and lower continuation and symmetry scores for “interesting” would support hypothesis 2. Since there were no significant differences between like and interesting, hypothesis 1 and 2 were not supported.

The absence of significant results in this analysis evidences the similarity between like and interesting for non-experts. In theory, these concepts are similar and in practice it was demonstrated that they are not different enough for producing a significant difference in the sorting of novice participants. Similarities for producing an aesthetic sorting under the “like” and “interesting” conditions were confirmed when analysing sorting duration. It was expected to find that participants would spend less time under the like condition because such condition would require low cognitive effort and high fluency. The opposite was expected for interesting: participants requiring high cognitive effort to appreciate disfluency and spending more time to complete the sorting. However, results showed that there is not a significant difference between interesting sorting duration and like sorting duration. These results, again, suggest that for novices “like” and “interesting” may not be sufficiently different concepts, at least in the method of production.

In order to test the results further, we grouped participants in subsets based on self-reported information provided in the questionnaire. We compared participants who used implied motion as an aesthetic criterion to participants that did not mention implied motion as an aesthetic criterion.

2.4.2 Criteria for Arranging the Cards: Movement Vs without Movement

Do we prefer symmetry and good continuation or asymmetry and bad continuation? It was hypothesised that global symmetry and good continuation would be liked, and that local symmetry and low continuation would be interesting. Since we applied the method of production, symmetry and continuation are our dependent variables. Participants produce interesting or liked sequences, then we measured whether these sequences were characterised by more or less symmetry and continuation. We hypothesise that, in the new subset, for the liking condition, global symmetry and continuation will be higher in the group that considered implied motion. If implied motion is not considered, local symmetry will be higher, because the implied transition from one image to the other mirrored image does not constitute good continuation.

According to these new subsets, hypothesis 1 was supported. These significant results were consistent across all the conditions. Under the “like” indication scissors’ continuation was higher for the group with movement than for the group without movement. On the “like” indication, corkscrew global symmetry and continuation was higher for the group with movement than for the group without movement. Liked corkscrew continuation was higher for the group without movement. Interesting posture local symmetry was higher for the group without motion and interesting posture continuation was higher for the group with motion.

We found that movement continuation and global symmetry were preferred when the sorting criteria implied movement, while local symmetry was preferred when the sorting criteria did not implied movement. This means that good continuation and global symmetry are preferred when considering implied motion.

2.4.3 Comparison across Images: Abstract, Scissors, Corkscrew, and Body Postures

Hypothesis 3 was not supported. Results only showed a significant difference for scissors interesting continuation and interesting corkscrew continuation when compared to interesting abstract continuation. The abstract images low scores regarding symmetry and continuation suggest that this is an adequate control condition. It can be interpreted as a low familiarity stimulus that is not showing a clear reference to the human body or to a physical object, and its physical rules,

leaving the participants with a difficulty to produce a clear aesthetic pattern in terms of symmetry and continuation. Our findings thus show an influence of familiar and meaningful object categories on aesthetic perception.

2.4.4 Favourite Set of Cards

Taking into account that postures were the favourite set of cards and that abstract was the least favourite, it is possible to say that these set of images can be used for follow-up experiments since these cards show opposite results in terms of movement preference and image preference. Abstract images should be used in follow-up experiments because it is the least preferred in terms of image liking and works as an adequate control stimulus in the task of implied motion production. Postures images should be used as well because it is the favourite set of cards in image liking and works as an adequate experimental stimulus in the task of producing implied motion sequences. Besides, body posture was the only condition that was sensible enough to show significant results for local symmetry when comparing between criteria. This means that opposite results of abstract images and body posture images could make an adequate tool for contrasting effects in further research.

In summary, hypothesis 1 was supported because participants use symmetry and continuation as compositional rules. This was evident in the comparison between criteria for arranging the cards; hypothesis 2 was not supported because participants did not distinguish between interestingness and liking. Hypothesis 3 was not supported because there are no significant differences between body and objects. The card sorting technique is a first step to apply the method of production in psycho-aesthetics of human movement. It was shown that good continuation was preferred when considering implied motion.

Next chapter will present a follow-up experiment. It will apply the method of production with a higher level of implied motion, this is, apparent motion, through the production of digital animated sequences. This would allow measuring aesthetic preference for actual animations, which is closer to actual performing arts or dancing itself.

CHAPTER 3

STUDY 2: AESTHETIC PREFERENCE FOR MOVEMENT IN ANIMATIONS PRODUCED BY NON-EXPERTS

3.1 Introduction

This chapter presents a follow-up study to the sequence production experiment previously explained. The present experiment covers the production of digital animations by non-experts in arts by applying the method of production with apparent movement, instead of sequences of static pictures. These aesthetic preferences were studied using the production of animated sequences or GIFs (Graphic Interchange Format, .gif files extension). The animations are the aesthetic object produced by participants, because such new technique allows to measure the aesthetic preference for apparent movement, which is closer to actual movement in performing arts.

The variables and rationale for studying them are the same as in the previous experiment, which were described in the previous chapter introduction. In brief, we study symmetry and continuation since they would require low cognitive effort for aesthetic appreciation, because they are easier to process visually, in line with visual fluency. In contrast, asymmetry and lack of good continuation would be more difficult to process (low fluency) and would require high cognitive effort to be appreciated. Also, as mention in study 1, considering past research that has linked motor familiarity to aesthetic preference (Kirsch et al., 2015; Kirsch et al., 2013), we will compare preference for abstract and human body images, since, in line with the embodied cognition framework (Glenberg & Kaschak, 2002; Glenberg et al., 2008), we would expect participants would prefer movements that are more directly related to their own human body than more distant shapes. Therefore, all these variables are useful to test the neurocognitive model of aesthetic appreciation in the performing arts (Orgs et al., 2016), which predict novices adopt a low cognitive effort strategy to appreciate human movement and performing arts.

Since the sequence production experiment did not show a significant difference between liking judgements and interestingness judgements in non-expert

participants, the present animation production task will ask non-experts to produce animations they like and animations they dislike to compare the different aesthetic products that are made for each judgement. As the previous experiment (sequence production experiment) showed that participants who considered implied motion produced higher symmetry and continuation for liking judgements compared to participants that did not consider implied motion, it is now hypothesised that participants will produce animations with higher symmetry and continuation (smooth motion) for liking judgements than for dislike judgements, because they will see apparent motion on the computer screen while producing the animations. In the sequence production experiment participants imagined the motion with static images, in this follow-up study participants saw apparent movement on the computer screen with animated images.

Since there were significant differences between abstract images and postures in the sequence production experiment, the animation production task will use abstract images and postures again. In the previous experiment, higher symmetry and continuation was produced with postures. The same is expected again in this new task.

In brief, the sequence production experiment used static pictures to evaluate the aesthetic production when considering implied motion. The animation task went one step further, using moving images to evaluate aesthetic production when perceiving apparent motion.

Hypothesis

Hypothesis 1. Participants will produce higher global symmetry and higher continuation for liking judgements than for disliking judgements.

Hypothesis 2. Participants will produce higher local symmetry for disliking judgements than for liking judgements.

Hypothesis 3. Participants will produce higher symmetry and continuation with body postures than with abstract images.

3.2 Methods

3.2.1. Participants

The final sample consisted of 28 non-experts in the domain of arts (24 female), of which 27 were Brunel University students and one was referred as an external volunteer. Participants were recruited through the online participant pool system of Brunel University London and through referral sampling. 24 first year Psychology students received credits. One participant received credits but was excluded from the final sample because it was apparent that was not fully engaged with the procedure. The mean age was 20 years (age range = 18 – 32 years). Nationalities were British or British/dual (n = 22), from European countries (n = 4), Indian (n = 1) and Congolese (n = 1). 8 participants had not received any kind of artistic education in the past. None of the participants reported art training at a professional level, 7 received art classes during their childhood, 10 at a recreational/exercise level and 5 at a vocational/teaching level. The artistic domains of training were performing arts (*n* = 13), visual arts (*n* = 4) and music (*n* = 1). Last time participants took art classes, in years (*M* = 5.47, *SD* = 3.80), years taking art classes (*M* = 3.14, *SD* = 3.97), number of annual visits to museums (*M* = 1.81, *SD* = 1.86), times per year to watch dance performances (*M* = 3.13, *SD* = 2.90). General educational background (previous/current studies) was in Psychology (26 participants), Law (1 participant) and Marketing (1 participant). Educational level was undergraduate for 24 participants and graduate for 4 participants.

3.2.2 Procedure

A digital adaptation of the card sorting technique was applied. Participants created digital animations with apparent movement (gifs) by sorting digital images according to their preference in sets of images that they would like and in sets of images that they would dislike following the indications given by the researcher. It was clarified that there were no right or wrong answer, and that it depended on their own criteria. Participants created the animations using the software PhotoScape. The speed of all the animations was always kept at 150 milliseconds, since previous research found participants preferred animated sequences displayed at that pace (Orgs et al., 2013). PhotoScape onscreen display was always kept at the same proportions, in a way that participants were able to see **1)** all the randomised images on the left side of the

screen, **2)** the images they were dragging and sorting on top of the screen, and **3)** the actual animation in the centre of the monitor. Other software to produce gifs did not show all these three components, only displayed the animation at the end of the sorting and not during the procedure. These was the main reason to choose PhotoScape, to be able to approximate to the replicability of the sequence production experiment. Twin mouse/keyboard were installed so the participant sat in front of the computer screen with a mouse and a keyboard, and the researcher was in an adjacent desk with the additional mouse/keyboard to load the images before each sorting and to save the screenshots and animations after each production task.

The procedure was repeated with 2 groups of images: abstract images or a human body back view. Abstract images and postures images were the same as used in the sequence production experiment. Each group of images consisted of 12 pictures, with each picture depicting the same object in a different position. Participants had up to 5 minutes to create the animations but they were encouraged to use less time if necessary. After sorting each group of images, participants informed the researcher about it in order to register the sorting duration using a stopwatch and then to take a screenshot of the results and to continue with the next set of images. The screenshots were done using the software Snipping Tool.

Participants received an information sheet accompanied by a verbal explanation of the experiment before signing a consent form. Then they read an instruction page (see appendix 3) and asked questions if necessary. To validate the information, the experimenter briefly explained the procedure. Later, the images were showed and the participant started the sorting procedure. The images seen by the participant were randomly shuffled before the experiment using the software RandomFileOrder.exe.

The duration of each sorting was registered with a stopwatch and a screenshot of the arranged images was taken by the researcher. A .gif file containing each animation was saved as well. Then the process was repeated for the “like” or “dislike” condition (this was randomised) with each set of images. After the sorting procedure, participants answered a brief questionnaire and were debriefed.

3.2.3 Measures

Measures were the same as in the sequence production experiment.

3.2.3.1 Global symmetry.

Diagonal images that are bilaterally mirrored in distant pairs of cards. The first with the last, the second with the penultimate and the third with the antepenultimate. It was scored from 0 to 3. Each pair of cards with global symmetry scored 1 point.

3.2.3.2 Local symmetry.

Diagonal images that are bilaterally mirrored closed together one next to each other. It was scored from 0 to 4 because it was a loop and the extremes could be counted as well. Each pair of cards with local symmetry scored 1 point.

3.2.3.3 Movement continuation.

How similar are the images that are together, how is the implied motion transition from one image to the next one (Orgs et al., 2013). It was scored from 0 to 7 because it was a loop and the extremes could be counted as well. Each pair of cards with “good” movement continuation scored 1 point.

3.2.3.4 Background questionnaire.

The performing arts background questionnaire was adapted from “The Watching Dance Project” (n.d.) and asked demographic information, artistic background, criteria for producing the animations, if participants found a difference between like and dislike, and favourite set of images.

The scoring of symmetry and movement continuation was done manually on the sorting screenshots after these were cropped and printed. Each sorting screenshot was compared to a reference pattern with the highest symmetry and continuation. The scoring procedure was performed twice in order to double check its results.

3.3 Results

3.3.1 Making Liked and Disliked Sequences

In order to test whether participants produced higher global symmetry and higher continuation for liking judgements and whether they produced higher local symmetry for disliking judgements, we compared symmetry and continuation scores produced

for liked and disliked sequences. Since data had a non-normal distribution, a non-parametric test was selected. In this case, a Wilcoxon Signed Rank Test was used to compare scores between liked and disliked sequences.

We tested if there were differences in participants' aesthetic production regarding different aesthetic judgements. Since the present hypotheses are directional, the results reported in this chapter are one-tailed. A Wilcoxon Signed Rank Test showed that participants produced significantly higher global symmetry with abstract images for liking judgements (*Mdn* = 0.00) than for disliking judgements (*Mdn* = 0.00), $z = -1.85$, $p < 0.05$, r = -0.25; significantly higher local symmetry with abstract images for liking (*Mdn* = 0.50) than for disliking (*Mdn* = 0.00), $z = -2.14$, $p < 0.05$, $r = -0.29$; significantly higher global symmetry with postures for liking (*Mdn* = 0.00) than for dislike (*Mdn* = 0.00), $z = -2.21$, $p < 0.05$, $r = -0.29$; and significantly higher continuation with postures for liking (*Mdn* = 3.00) than for dislike (*Mdn* = 2.00), $z = -1.79$, $p < 0.05$, $r = -0.24$. See figures 3.1, 3.2, 3.3, 3.4.

The Wilcoxon Signed Rank Test showed there were no significant differences between continuation produced with abstract images for dislike judgements (*Mdn* = 2.00) and continuation produced with abstract images for liking judgements (*Mdn* = 3.00), z = -1.08, $p > 0.05$; local symmetry produced with postures for dislike judgements (*Mdn* = 0.00) and local symmetry produced with postures for liking judgements (*Mdn* = 0.00), z = -0.16, p > 0.05.

3.3.2 Making Abstract and Body Posture Sequences

In order to test whether participants produced higher symmetry and continuation with body postures than with abstract images, we compared symmetry and continuation scores produced for abstract and body sequences. Since data had a non-normal distribution, a non-parametric test was selected. In this case, a Wilcoxon Signed Rank Test was used to compare scores between abstract and body sequences.

The Wilcoxon Signed Rank Test showed no significant differences when comparing aesthetic features produced with abstract images against aesthetic features produced with body postures images: continuation produced with postures for liking judgements (*Mdn* = 3.00) and continuation produced with abstract images for liking judgements (*Mdn* = 3.00), $z = -0.39$, $p > 0.05$; global symmetry produced with postures for liking judgements (*Mdn* = 0.00) and global symmetry produced with

abstract images for liking judgements (*Mdn* = 0.00), z = -0.20, *p* > 0.05; local symmetry produced with postures for liking judgements (*Mdn* = 0.00) and local symmetry produced with abstract images for liking judgements (*Mdn* = 0.50), z = -1.20, *p* > 0.05; continuation produced with postures for dislike judgements (*Mdn* = 2.00) and continuation produced with abstract images for dislike judgements (*Mdn* = 2.00), z = -0.58, *p* > 0.05; global symmetry produced with postures for dislike judgements (*Mdn* = 0.00) and global symmetry produced with abstract images for dislike judgements (*Mdn* = 0.00), z = 0.00, p > 0.05; local symmetry produced with postures for dislike judgements (*Mdn* = 0.00) and local symmetry produced with abstract images for dislike judgements (*Mdn* = 0.00), z = -1.11, *p* > 0.05. In summary, there were no significant differences between abstract and body posture sequences.

3.3.3 Duration of Sequence Making

In order to explore whether sorting duration significantly varied across conditions, we compared the durations across images. Since data were non-normally distributed, we selected non-parametric tests. For the comparisons across images, Friedman's ANOVA was used.

A Friedman Test showed there were no significant differences in the time (measured in seconds) participants used to produce the different animations: time to create animations with abstract images for liking judgements (*Mdn* = 81.50), time to create animations with abstract images for dislike judgements (*Mdn* = 74.50), time to create animations with postures for liking judgements (*Mdn* = 84.00), and time to create animations with postures for dislike judgements (*Mdn* = 77.50), χ^2 (3, *n* = 28) = 4.65, p > 0.05.

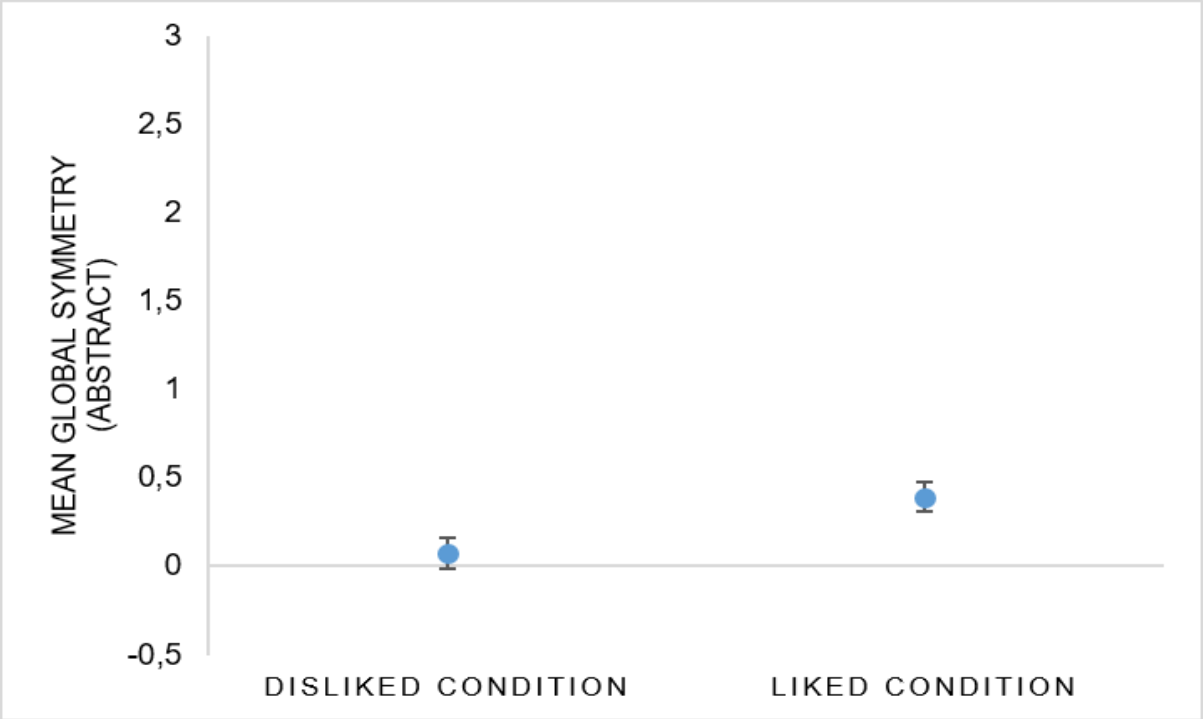

Figure 3.1. Global symmetry produced with abstract animations for liking and dislike judgements. Point plots indicate mean scores. Error bars represent SEM.

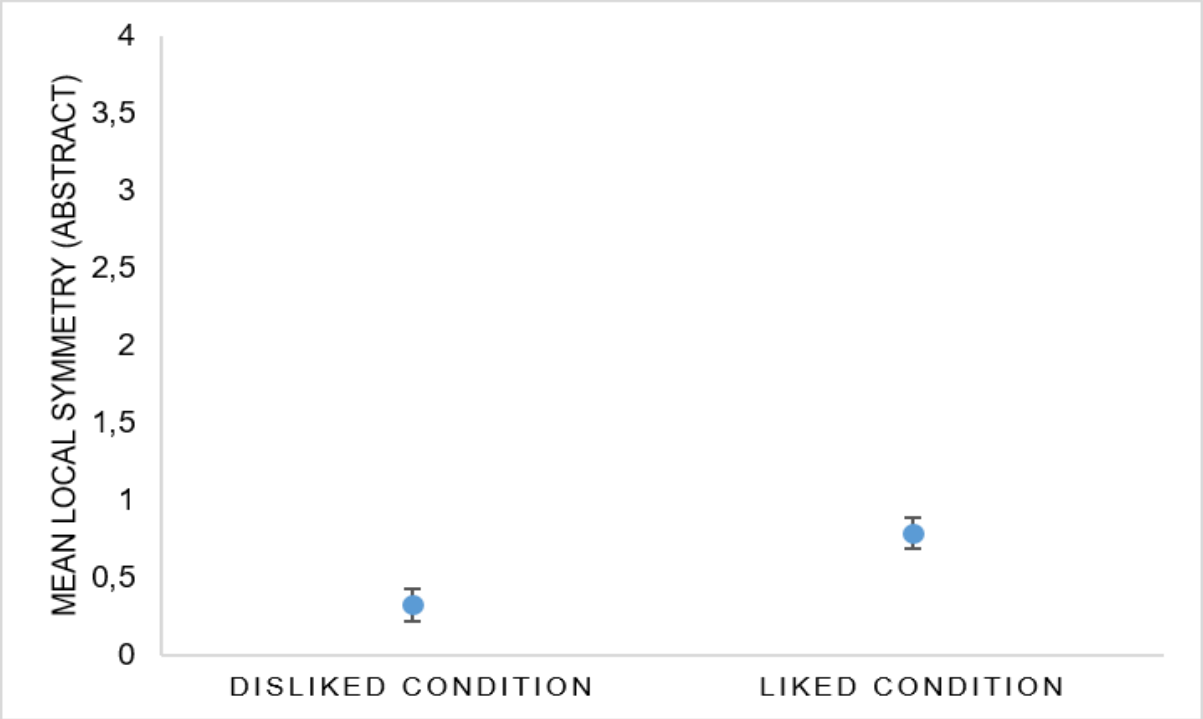

Figure 3.2. Local symmetry produced with abstract animations for liking and dislike judgements. Point plots indicate mean scores. Error bars represent SEM.

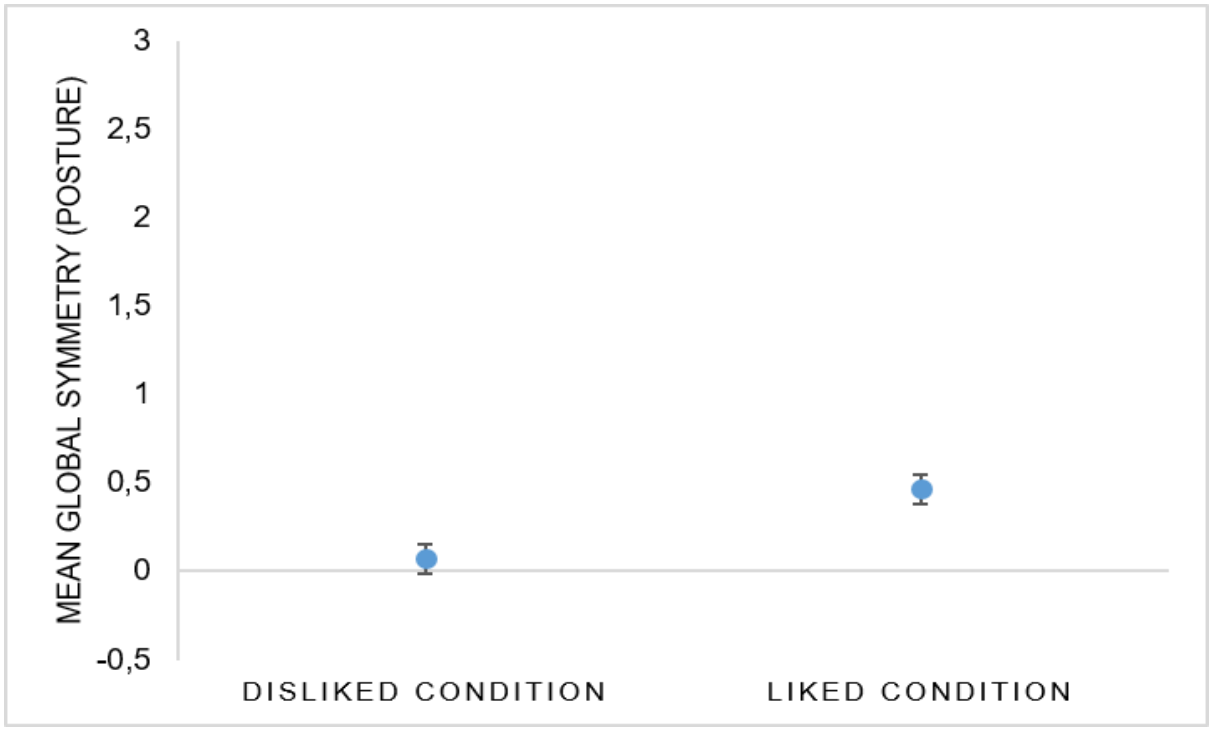

Figure 3.3. Global symmetry produced with body animations for liking and dislike judgements. Point plots indicate mean scores. Error bars represent SEM.

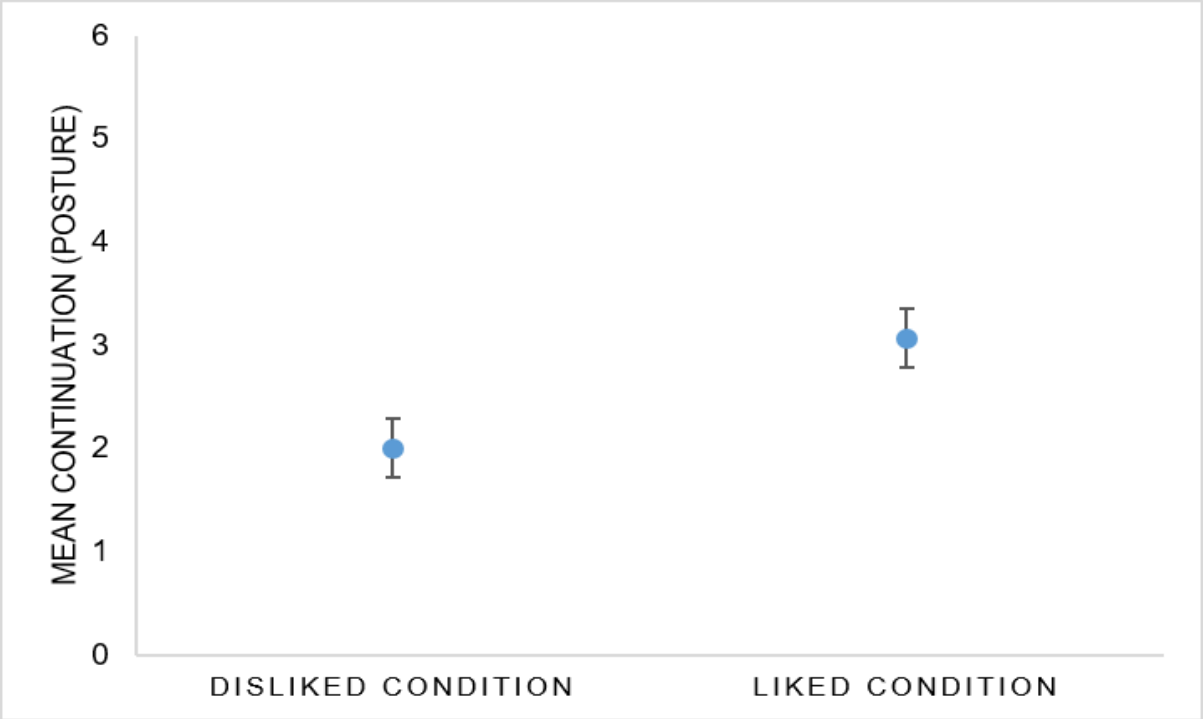

Figure 3.4. Movement continuation produced with body animations for liking and dislike judgements. Point plots indicate mean scores. Error bars represent SEM.

3.3.4 Self-reported Measures

All participants reported they found a difference between the animations they created for liking and the ones they produced for dislike. According to the descriptions reported, criteria for producing liked animations were characterised under the following not mutually exclusive categories (cases may appear in more than one category): order/continuation (n = 19), fluency (n = 11), symmetry (n = 5), natural/real (n = 5), positive valence (n = 3), variety (n = 2), high arousal (n = 1), synchrony (n = 1), big (n = 1) and interestingness (n = 1). Criteria for producing disliked animations was inclusively categorised as (cases may appear in more than one category): random/disorder (n = 19), abrupt/disfluent (n = 5), simple (n = 3), asymmetry/unbalanced (n = 2), small (n = 1), vigorous (n = 1), negative valence (n = 1).

Participants reported their favourite animations were: animations produced with body postures for liking judgements (n = 20), animations produced with abstract images for liking judgements (n = 6), animations produced with body postures for both liking judgements and dislike judgements (n = 1), no favourite animation (n = 1).

3.4 Discussion

This study hypothesised that participants would produce higher global symmetry and higher continuation for liking judgements' animations (Hypothesis 1), higher local symmetry for the dislike judgements' animations (Hypothesis 2) and that participants would produce animations with higher symmetry and continuation when using body postures than when using abstract images (Hypothesis 3). The first hypothesis was supported. This means that, in line with the neurocognitive model of dance appreciation (Orgs et al., 2016), non-experts prefer aesthetic objects with higher fluency (in this case, higher global symmetry and higher continuation) because that information is easier to process. These findings are in line with other theoretical claims that favour simplicity and familiarity over complexity and novelty, including the mere exposure effect (Zajonc, 1968), Gestalt theories (Arnheim,1974) and prototypicality (Martindale & Moore, 1988). Such preference for smoothness and symmetry stimuli is corroborated with the descriptions reported by participants in

which most of them mentioned criteria congruent with order, continuation, symmetry and fluency.

The second hypothesis was not supported. Since the transition from one image to the next mirrored image constitute bad continuation, we expected higher local symmetry in the disliked animations. However, we found higher local symmetry for the liked sequences. This means that it seems participants do not apply compositional rules of local symmetry to produce disliked animations when appreciating apparent motion, but rely on local symmetry when producing sequences of static images when implied motion is not considered, as seen in the previous chapter.

Hypothesis 3 was not supported because there were not significant differences, regarding symmetry and continuation, between the production of animations with abstract images and body postures. These results, from the sequence production experiment and the production of animations experiment, show that when the stimuli are static and implied motion is considered, participants need an explicit reference to the human body or to everyday objects to be able to produce smooth and symmetrical aesthetic objects. When participants are perceiving apparent motion, non-experts will be able to produce smooth and symmetrical aesthetic objects no matter if visual stimulus is abstract or if it explicitly depicts the human body. In other words, when watching and producing animations, non-experts prefer fluency. Nevertheless, there are no significant differences between stimulus class in the production of animations. One explanation for this lack of stimulus category effects is that people engage with these stimuli for a relatively long time and not just for a couple of seconds or even less. This suggests that producing aesthetically pleasant apparent motion rely on the same compositional rules (good continuation and symmetry) for both abstract and human body sequences.

However, participants self-reported they prefer human body sequences to abstract sequences. This is evidenced in the open question about favourite sorting of cards and favourite animations, where the majority of participants stated they preferred the body postures. Such results are in accordance with previous studies that have found novices prefer representative over abstract art (Furnham & Walker, 2001; Hekkert & van Wieringen,1996; Illes, 2008; Pihko et al., 2011; Uusitalo et al.,

2009). Our first two studies that applied the method of production extend these findings to sequences of images with implied and apparent motion. Sequences that represent actual human movements are preferred to sequences that show movement of abstract shapes.

One way to understand this is by considering the embodied cognition framework and its possible links to aesthetic perception of human movement. If we hypothesised that perception is guided by abstract logical rules without any reference to the human body nor the environment (classical cognitivist approach), non-experts would equally prefer both abstract animations and human body animations when having similar levels of symmetry and continuation. However, this is not the case. One possible explanation is that such consistent patterns found in the sequence production experiment and in the animation task can be linked to the embodied cognition framework because most of the participants prefer depictions of the human body over its abstract representations. Participants prefer smooth and symmetrical representations of everyday objects that can be manipulated or operated in the physical world. In other words, the aesthetic movement executed by a concrete performer will be preferred over a similar aesthetic motion executed by an abstract object. Based on the findings from these two experiments it is plausible to propose that aesthetic perception of human movement is influenced not only by the fluency of perceived motion but also by the visual representation of the object that is performing the action.

As seen in this chapter, the method of production was successfully applied to study aesthetic preference for human movement through the card sorting technique and the animation task. The following experiments will test whether these conclusions can be generalised to the method of choice or if they are specific to the method of production.

CHAPTER 4

STUDY 3: AESTHETIC PERCEPTION OF HUMAN BODY ANIMATIONS

4.1 Introduction

In the previous two chapters, the method of production was applied to study aesthetic perception of human movement and it was found that non-experts prefer smooth and symmetrical movements. The present chapter will report an experiment in which the method of choice was applied to determine whether results are consistent with results from method of production.

As described earlier, in the method of choice the researcher designs the aesthetic stimulus and participants rate it according to their aesthetic judgement. Here, the method of choice will represent some innovations in the experimental design. For instance, in previous chapters, movement continuation was a dependent variable we measured. Now, movement continuation (smooth/abrupt) will be a condition we will manipulate. Besides, the method of choice gives us more freedom to easily add a new condition that could have been a variable too complex for the method of production: movement synchrony, understood as interindividual movement coordination (synchrony/asynchrony). Synchronous movements would be those in which dancers are performing the same movements at the same time. An example of asynchrony would be dancers executing different postures in the same frame. Symmetry will be kept constant to maintain a simple design without generating too much conditions for participants to see. In line with findings from the previous two chapters, and considering the neurocognitive model of dance appreciation (Orgs et al., 2016), it is expected that participants will prefer synchronous and asynchronous smoothness and will dislike synchronous and asynchronous abruptness.

As mentioned in the introduction of studies 1 and 2, previous research has found expertise influences visual perception (Furnham & Walker, 2001; Hekkert & van Wieringen,1996; Illes, 2008; Pihko et al., 2011; Uusitalo et al., 2009), therefore, we will apply again a background questionnaire to register participant's artistic formation and demographic data, but now with some modifications. Since the

present study will apply the method of choice only (participants will watch and rate the videos), this background questionnaire will not ask questions related to the method of production, such as criteria to arrange the cards, etc. Considering that participants will watch apparent movement, the present background questionnaire will be focused on dance experience and dance exposure as well.

In line with our general introduction, synchronous movement has been studied from social psychology, emphasising the social benefits of performing or watching joint actions (Wiltermuth & Heath, 2009; Tarr et al., 2015; Eskenazi et al., 2015; Lakens & Stel, 2011). However, from the perspective of psychology of aesthetics, there is a gap in knowledge regarding the psychological processes behind the aesthetic experience of watching synchronous dance. Synchronous human movement occurs in everyday life and in performing arts, whenever there is a group of people performing a similar activity: in common actions such as a group of commuters walking in the same direction, or in a professional choreography. There are different levels of synchrony; some of them might be less strict, as in the case of people walking down the street. Others might be stricter, as in the case of a highly precise choreography. In any case, synchrony is one of the most basic and universal aesthetic features we can find in grouped human movement, across different cultures, rituals, religions, and dances (Christensen & Calvo-Merino, 2013). For this reason, it is relevant to understand the psycho-aesthetic appeal of such coordinated actions.

In the present thesis, we will operationalise synchrony as performing with the same exact timing. In this way, the perceived human movement will be more related to the purposeful synchrony we see in military parades and performing arts, such as popular dance, traditional dances or classical ballet. In contrast, asynchrony will be presented in the form of a group of dancers performing different movements separately. This kind of asynchrony can be found in contemporary dance, among other styles.

In the first two experiments, we discussed the importance of studying good continuation, bad continuation, how they are related to processing fluency, and how they are useful to test the neurocognitive model of dance appreciation (Orgs et al., 2016). In the first study, we used the terms good and bad continuation, because the

experiment utilised printed cards, meaning that the transition between postures was implied. Since the stimuli were static, we employed the good continuation principle to express the idea of implied smooth motion, and bad continuation to produce abrupt motion. In the second experiment, good/bad continuation was not static, but dynamic, since participants produced digital animations with apparent smooth/abrupt motion. Now, in study 3, participants watch apparent smooth/abrupt movements displayed in video clips that were produced by the researcher. The principle is the same: a smooth movement is a close, sequential transition between similar postures that gradually change position. In turn, an abrupt movement is a distant, nonsequential shift between different postures that suddenly change position and orientation.

In the present experiment, participants will watch the video clips and will report their aesthetic judgements, in line with the method of choice. One of the most widely used techniques to record participants' responses in this type of studies is the semantic differential scale (Osgood, 1957; Berlyne, 1974). Semantic differential scales measure the meaning an observer associates to a given stimulus, be it a word, a picture, or a video clip. These scales show two opposite adjectives on a horizontal plane separated by different points or spaces, which represent a degree of proximity or remoteness to one or the other adjective. One of the main advantages of semantic differential scales is that they allow the recollection of participants' impressions across a wide variety of aspects/dimensions of meaning in short time (Osgood, 1957). Also, it has been found that the semantic differential can reduce the acquiescence bias (a tendency to agree with positive sentences), in comparison with similar questionnaires presented in Likert scale format (Friborg, Martinussen, & Rosenvinge, 2006). However, sometimes, some of the adjectives used in semantic differential scales might be difficult to understand for participants (Al-Hindawe, 1996). For that reason, in the present experiment, we will ask some of the participants open-ended questions about some adjectives they used to rate the video clips. In this way, we will assess whether participants understand the meaning of the adjectives (Al-Hindawe, 1996).

In the present experiment, the logic behind applying the semantic differential scales is that one group of adjectives will be associated to synchrony, while the opposite group of adjectives will be associated to asynchrony. The same would

happen with movement continuation: one group of adjectives would be associated to smooth movements, while opposite adjectives would be associated to abrupt movements. Since they are different aesthetic features, we expect they should be associated to different meanings. Moreover, we expect some of those aesthetic features and judgements will be associated to liking judgements whereas opposite aesthetic features and adjectives would be associated to judgements of dislike.

As we explained in the general introduction and in study 1, some aesthetic features are easier to process than others. For instance, good continuation, smooth motion, and symmetry are easier to process than bad continuation, abrupt motion, and asymmetry, respectively. The same happens with synchrony and asynchrony. Synchronous movement follows the gestalt principle of “common fate” (Arnheim, 1974; Koffka, 1935; Wertheimer, 1923/1938), which states that a group of objects/persons moving in the same direction, at the same speed (this is, moving in synchrony), will be perceived as part of the same whole. In addition, according to Berlyne (1972), irregularity of arrangement and heterogeneity of elements are some of the configurations that increase visual complexity, this is, more difference between elements of the configuration. In contrast, having a regular arrangement and homogeneity of elements increase redundancy, this is, similarities between elements of a configuration. In this sense, synchrony would be easier to process visually than asynchrony, since synchronous movement is more redundant (same movements/postures), while asynchronous movement is more complex (different movements/postures). Considering that synchrony would be easier to process than asynchrony, it is expected that, in line with the neurocognitive model of dance appreciation (Orgs et al., 2016), novices would prefer to watch synchronous movement to asynchronous movement, since appreciating synchrony would require low cognitive effort strategies in comparison to appreciating asynchrony. In line with this neurocognitive model (Orgs et al., 2016) and with the previous two experiments, it is also expected that smoothness will be preferred to abruptness.

Eight semantic differential scales were used to measure participants' aesthetic judgements (dislike – like; calming – exciting; repeated – varied; accidental – controlled; uniform – diverse; unfamiliar – familiar; subtle – obvious; sad – happy). These semantic differential scales were included because they have been applied in previous research to assess aesthetic responses when observing artistic stimuli such

as paintings, i.e., dislike-like, calming-exciting, repeated-varied, accidental-controlled, subtle-obvious, sad-happy (Tucker, as cited in Osgood, 1957) and dance moves, i.e., dislike-like (Calvo-Merino et al., 2008). Also, we applied these semantic differential scales to test our hypothesis. We expect some aesthetic judgements will be associated to high cognitive effort strategies of aesthetic appreciation (Orgs et al., 2016), while others will be related to low cognitive effort strategies.

If novices are adopting a low cognitive effort strategy, liking judgements will be associated to smoothness/synchrony and to the adjectives calm, repeated, controlled, uniform, familiar, obvious, and happy. When adopting a low cognitive effort strategy, observers will prefer to watch movements that are easier to process visually (visual fluency), for instance, they will prefer to process redundant information (Berlyne, 1972), this is, *repeated* and *uniform* movements, which, in turn, should be associated to synchronous movements, since in synchronous choreographies, dancers are *repeating* the same movements, showing a global *uniformity* of the motion. In the same line, low cognitive effort appreciation would be associated to the preference for *obvious*, *familiar* and smooth *controlled* movements, because obvious movements are easier to process than subtle motion, familiarity increases fluency (Reber et al., 2004), and controlled movements are more predictable/recognisable than accidental ones (Grossman & Blake, 2002; Hiris, 2007; Neri et al., 1998; Poom & Olsson, 2002; Pyles et al., 2007; Simion et al., 2008). In other words, *obviousness*, *familiarity* and *control* diminish uncertainty of what is being perceived, meaning that these features increase fluency. Since positive valence is associated to processing fluency (Reber et al., 2004), we expect calmness and happiness will correlate with liking in novice participants since they would adopt a low cognitive effort strategy of aesthetic appreciation. In turn, abruptness/asynchrony will be disliked and associated to the opposite adjectives (exciting, subtle, unfamiliar, diverse, varied, sad and accidental) because it will be more difficult to process.

Hypothesis 1. Smooth synchrony and smooth asynchrony will be preferred over abrupt synchrony and abrupt asynchrony.

Hypothesis 2. Smooth synchrony and smooth asynchrony will be associated with the adjectives calm, obvious, familiar, uniform, repeated, happy and controlled. Abrupt synchrony and abrupt asynchrony will be associated with exciting, subtle, unfamiliar, diverse, varied, sad and accidental.

4.2 Methods

4.2.1 Participants

Participants were first year psychology students from Brunel University (n = 30, 29 female), age range (18 – 20, *M* = 18.90, *SD* = .80). Six participants reported having previous professional dance training, 24 participants had no professional dance training, five participants reported being frequent visitors of dance performances, and 24 were not frequent visitors of dance performances (one missing value). 24 participants were from the UK, five from Europe and one from India. All participants were recruited through Brunel University's participant pool system and received course credits for participation.

4.2.2 Materials

Stimuli consisted of muted black and white video clips presenting four types of digital animations depicting two dancers (see figure 4.1). The video animations were based on the same human body back view images used in the sequence production experiment and production of animations experiment. Images used in the previous two experiments showed just one dancer in different postures. For this experiment, the same body postures' images were duplicated side by side, now depicting two dancers at the same time. In this way, a 2 x 2 factorial within-subjects design manipulated the interaction between synchrony (synchronous, asynchronous) and movement continuation (smooth, abrupt). The resulting four conditions were:

1. Videos depicting smooth movements preformed in synchrony: Both dancers performed the same posture at the same time, and the transition between one posture to the other was smooth.

2. Videos depicting smooth movements performed in asynchrony: Dancers assumed different postures in each frame, and each of the dancers performed a sequence of smooth movements.

3. Videos depicting abrupt movements performed in synchrony: Dancers assumed the same postures in each frame, and performed a sequence of abrupt movements.

4. Videos depicting abrupt movements performed in asynchrony: Dancers adopted different postures in each frame, and performed a sequence of abrupt movements.

Frames were edited as image files with Microsoft Publisher, and then converted to video format with Windows Movie Maker. Each video consisted of one sequence of seven frames that was repeated in 6 loops, with each frame lasting 150 milliseconds. In total, each video lasted 6.3 seconds. In each of the four conditions eight videos were presented (four with movement orientation from left to right, and four in the opposite direction), totalling 32 videos for the entire experiment.

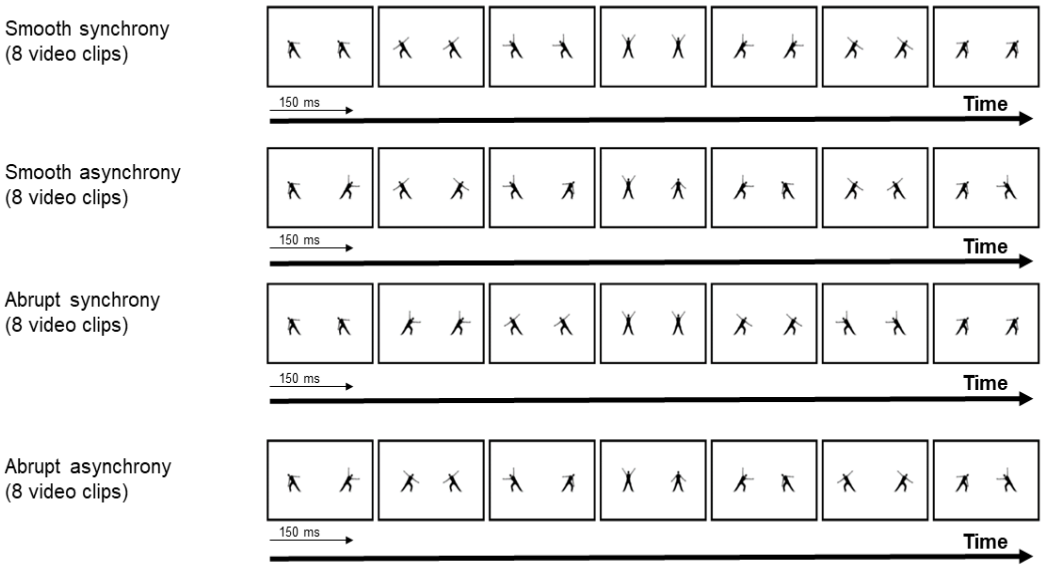

Figure 4.1. Example of the frames used for the human body video animations.

4.2.3 Measures

To compare results from the method of choice (studies 3, 4, and 5), we used the same eight 7-point semantic differential scales to measure aesthetic ratings of the dance video clips. Participants were instructed to use the semantic differential scales to rate each dance video clip based on the dance movements they see in the videos, ignoring the clothes of the dancers or the background of each scene. There were 8 items below each video clip. The order of videos and semantic differential scales were randomised. We assessed the following concepts.

1. aesthetic evaluation (dislike – like);

2. arousal (calming – exciting);

3. variety (repeated – varied);

4. control (accidental – controlled);

5. diversity (uniform – diverse);

6. familiarity (unfamiliar – familiar);

7. obviousness (subtle – obvious);

8. happiness (sad – happy).

The aesthetic evaluation scale was used to measure aesthetic preference for the video animations. Since previous studies (Berlyne, 1974; Christensen, Nadal, Cela-Conde, & Gomila, 2014; Orgs et al., 2013) have identified valence and arousal as relevant judgements in aesthetic appreciation, happiness (sad – happy) and arousal (calming – exciting) scales measured these constructs. Variety (repeated – varied), diversity (uniform – diverse), control (accidental – controlled), and obviousness (subtle – obvious) scales were applied to assess participants' aesthetic judgement of movement's visual features. The familiarity scale (unfamiliar – familiar) tested whether participants were familiarised with the movements on display.

4.2.3.1 Open-ended questionnaire.

This printed questionnaire asked for the meaning of the adjectives “unfamiliar-familiar”, “accidental-controlled” and “subtle-obvious” presented in the semantic differential scales. This was done to verify whether the adjectives used in the semantic differential scales were meaningful for participants.

4.2.3.2 Background questionnaire.

The background questionnaire asked participants’ demographic data, such as gender, age, nationality, ethnicity, language spoken at home, whether the respondent have received professional dance training, number of years attending dance classes, kind of dance practiced and whether the respondent was a frequent visitor of dance performances.

4.2.4 Procedure

The experiment was lab based and it was created with Survey Monkey to facilitate future online replications. The survey was programmed to randomise and counterbalance the items automatically and to keep a specific order for the general sections.

Participants signed a printed inform consent form and received brief oral instructions and general information about the study. At the beginning of the experiment general information describing purpose of the survey was displayed again. Then 32 video animations were randomly presented. Videos were presented one by one and participants rated each dance scene using sematic differential scales that were below each one of the video clips (dislike – like; calming – exciting; repeated – varied; accidental – controlled; uniform – diverse; unfamiliar – familiar; subtle – obvious; sad – happy). These semantic differential scales were randomised.

Then, participants filled a background questionnaire. After this, the first 14 participants answered an open-ended questionnaire about the meaning of three pairs of adjectives presented in the semantic differential scales (“unfamiliar-familiar”,

"accidental-controlled" and "subtle-obvious"). All participants were debriefed at the end of the experiment.

4.3 Results

In studies 3, 4, and 5, we computed all the 7-point Likert scales as ranging from -3 to 3, meaning that a tendency towards negative values would represent proximity to one construct, while a positive tendency would represent proximity towards the opposite construct. To test the influence of movement continuation (smooth/abrupt) and synchrony (synchrony/asynchrony) on aesthetic perception, two-way repeated measures ANOVA were conducted. These conditions (smooth/abrupt; synchrony/asynchrony) were within subject. Therefore, two-way repeated measures ANOVA were selected to test such influence.

4.3.1 Influence of Continuation and Synchrony on Aesthetic Preference

The interaction effect between continuation and synchrony regarding aesthetic preference was not significant, Wilks' Lambda = .93, F (1, 29) = 2.21, $p > .05$. Smooth movements were preferred over abrupt movements in both synchronous and asynchronous conditions. The main effect of continuation on mean liking judgement was significant, where participants preferred, as mentioned before, smooth movements over abrupt ones, Wilks' Lambda = .55, F (1, 29) = 23.48, $p <$ .001, partial eta squared = .45. The main effect of synchrony on mean liking judgement was significant too. In this case, participants preferred synchrony over asynchrony (see figure 4.2), Wilks' Lambda = .47, F (1, 29) = 32.54, $p < .001$, partial eta squared = .53. It was found that participants prefer smooth movements performed in synchrony, followed by abrupt movements performed in synchrony, smooth movements performed in asynchrony, and abrupt movements performed in asynchrony.

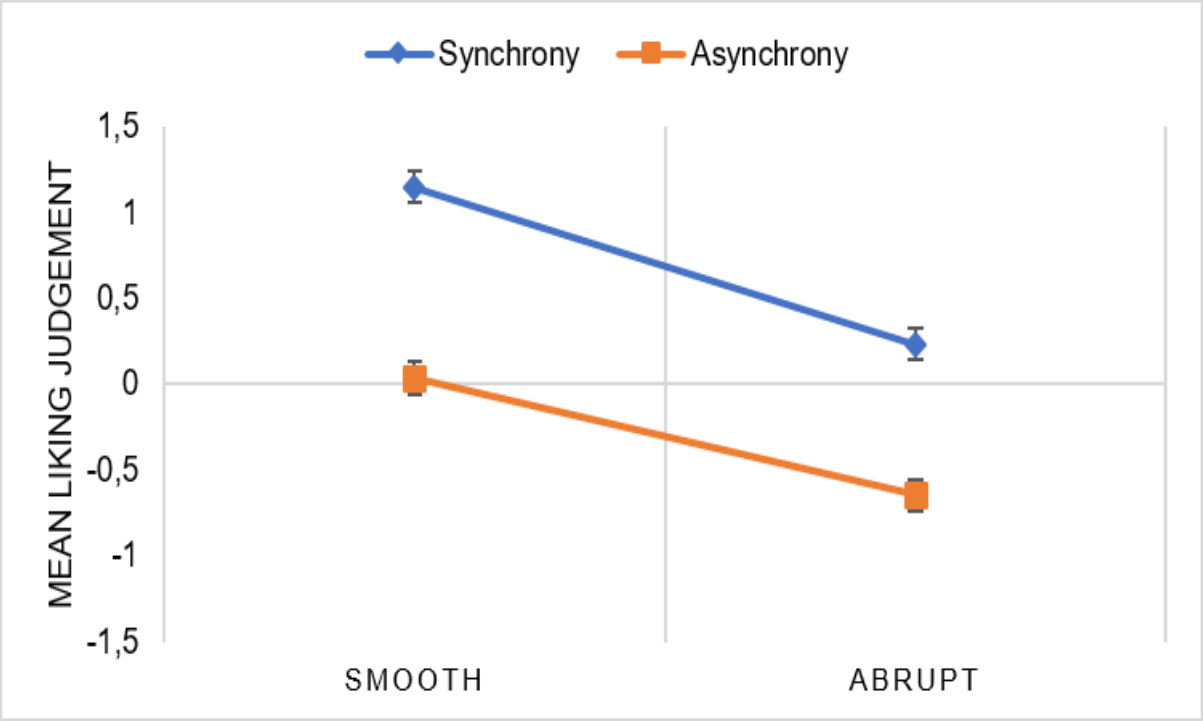

Figure 4.2. Aesthetic preference for movement continuation and synchrony. Error bars represent Standard Error of the Mean (SEM).

4.3.2 Influence of Continuation and Synchrony on Judgement of Arousal

In this experiment, this was the only interaction effect (interaction between continuation and synchrony regarding judgement of arousal) that was significant, Wilks' Lambda = .75, F (1, 29) = 9.92, $p < .05$, partial eta squared = .26. Abrupt movements were perceived as more exciting for both synchronous and asynchronous conditions. However, smooth movements performed in asynchrony were more exciting than synchronous movements (see figure 4.3).

The main effect of continuation on judgement of arousal was significant, where abrupt movements were perceived as more exciting than smooth movements, Wilks' Lambda = .28, F (1, 29) = 74.43, $p < .001$, partial eta squared = .72. Also, the main effect of synchrony on judgement of arousal was significant, Wilks' Lambda = .66, F (1, 29) = 14.99, $p < .001$, partial eta squared = .34. As noted in the interaction effect, asynchronous movements were more exciting than synchronous movements, but this difference was significant for smooth movements only. When movements were abrupt, synchronous and asynchronous movements were not significantly different in terms of arousal. In other words, abrupt movements performed in asynchrony and in synchrony were similarly exciting. This means that if the animation is performing abrupt movements, it doesn't matter if it is in synchrony or asynchrony, the choreography will be judged as more exciting than a performance with smooth movements in synchrony or asynchrony. However, if the animation is performing smooth movements, asynchronous movements will be more exciting than synchronous movements. This was confirmed by dependent t-tests, which showed significant simple effects. Smooth asynchrony (M = -.34, SD = .91) was significantly more exciting than smooth synchrony (M = -.98, SD = 1.24), t(29) = -3.92, $p < .05$, r = .59. However, there were no significant differences between abrupt asynchrony (M = 1.19, SD = .83) and abrupt synchrony (M = 1.12, SD = .81), t(29) = -.87, $p > .05$.

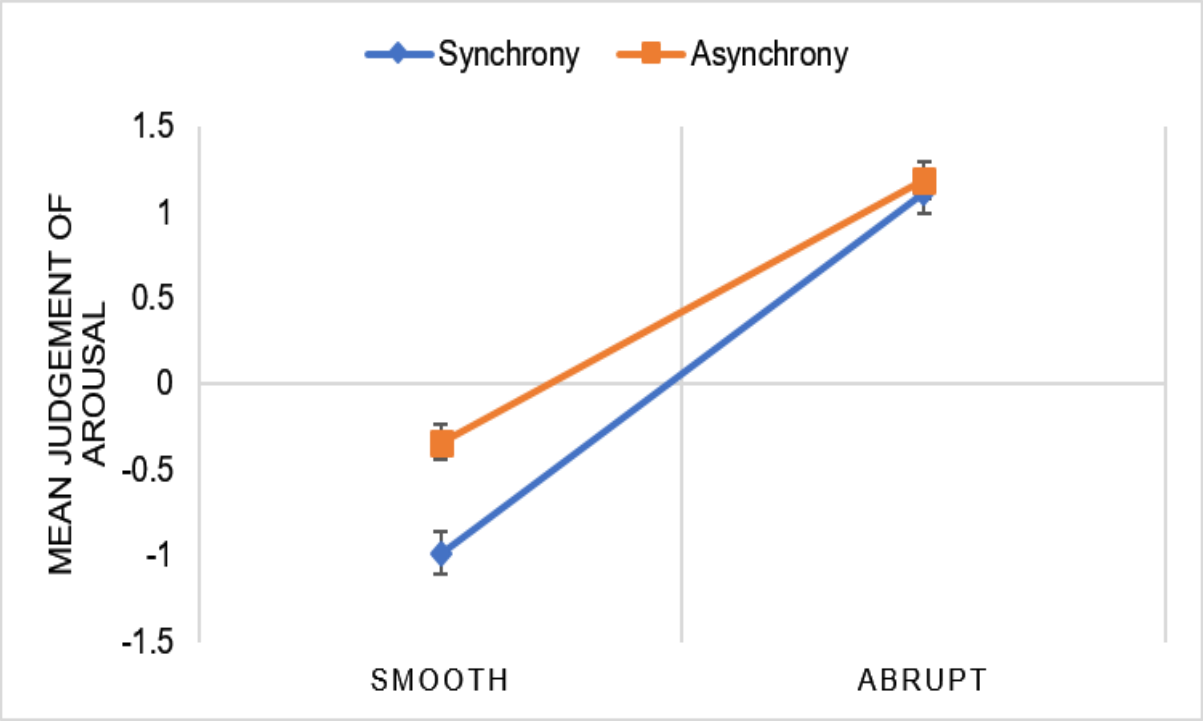

Figure 4.3. Judgement of arousal for movement continuation and synchrony. Error bars represent SEM.

4.3.3 Influence of Continuation and Synchrony on Judgement of Control

The interaction effect between continuation and synchrony regarding judgement of control was not significant, Wilks' Lambda = .92, F (1, 29) = 2.39, p > .05. The main effect of continuation on judgement of control was significant, Wilks' Lambda = .40, F (1, 29) = 43.39, p < .001, partial eta squared = .60. Smooth movements were perceived as more controlled than abrupt ones. The main effect of synchrony on judgement of control was significant too, Wilks' Lambda = .34, F (1, 29) = 57, p < .001, partial eta squared = .66. Synchronous movements were perceived as more controlled than asynchronous movements.
Movements were perceived, from the most controlled to the least controlled as follows: smooth synchrony, abrupt synchrony, smooth asynchrony, abrupt asynchrony.

4.3.4 Influence of Continuation and Synchrony on Judgement of Variety

The interaction effect between continuation and synchrony regarding judgement of variety was not significant, Wilks' Lambda = .96, F (1, 29) = 1.19, p > .05. The main effect of continuation on judgement of variety was significant, Wilks' Lambda = .58, F (1, 29) = 20.94, p < .001, partial eta squared = .42. Abrupt movements were perceived as more varied than smooth movements. The main effect of synchrony on judgement of variety was significant as well, Wilks' Lambda = .35, F (1, 29) = 53.10, p < .001, partial eta squared = .65. Asynchronous movements were perceived as more varied than synchronous movements.
Movements were perceived, from the most varied to the least varied, as follows: abrupt asynchrony, smooth asynchrony, abrupt synchrony, smooth synchrony.

4.3.5 Influence of Continuation and Synchrony on Judgement of Diversity

The interaction effect between continuation and synchrony regarding judgement of diversity was not significant, Wilks' Lambda = .99, F (1, 29) = .32, p > .05.
The main effect of continuation on judgement of diversity was significant, Wilks' Lambda = .49, F (1, 29) = 30.75, p < .001, partial eta squared = .52. Abrupt movements were perceived as more diverse than smooth movements. The main effect of synchrony on judgement of diversity was significant, Wilks' Lambda = .41, F

(1, 29) = 42.36, $p < .001$, partial eta squared = .59. Asynchronous movements were judged as more diverse than synchronous movements. Movements were rated, from the most diverse to the least diverse, as follows: abrupt asynchrony, smooth asynchrony, abrupt synchrony, smooth synchrony.

4.3.6 Influence of Continuation and Synchrony on Judgement of Familiarity

The interaction effect between continuation and synchrony regarding judgement of familiarity was not significant, Wilks' Lambda = .98, F (1, 29) = .49, $p > .05$.

The main effect of continuation on judgement of familiarity was significant, Wilks' Lambda = .58, F (1, 29) = 20.97, $p < .001$, partial eta squared = .42. Smooth movements were perceived as more familiar than abrupt ones. The main effect of synchrony on judgement of familiarity was significant as well, Wilks' Lambda = .46, F (1, 29) = 33.60, $p < .001$, partial eta squared = .54. Synchronous movements were perceived as more familiar than asynchronous movements. Movements were rated from the most familiar to the least familiar, as follows: smooth synchrony, abrupt synchrony, smooth asynchrony, abrupt asynchrony.

4.3.7 Influence of Continuation and Synchrony on Judgement of Obviousness

The interaction effect between continuation and synchrony regarding judgement of obviousness was not significant, Wilks' Lambda = .99, F (1, 29) = .25, $p > .05$.
The main effect of continuation on judgement of obviousness was significant, Wilks' Lambda = .70, F (1, 29) = 12.33, $p < .001$, partial eta squared = .30. Interestingly, abrupt movements were perceived as more obvious than smooth movements (see figure 4.4).

Another interesting finding was that the main effect of synchrony on judgement of obviousness was not significant, Wilks' Lambda = .99, F (1, 29) = .23, $p > .05$. There is no significant difference between synchrony and asynchrony regarding judgement of obviousness. In other words, it seems it doesn't matter whether movements are synchronous or asynchronous, both are obvious for participants in this experiment.

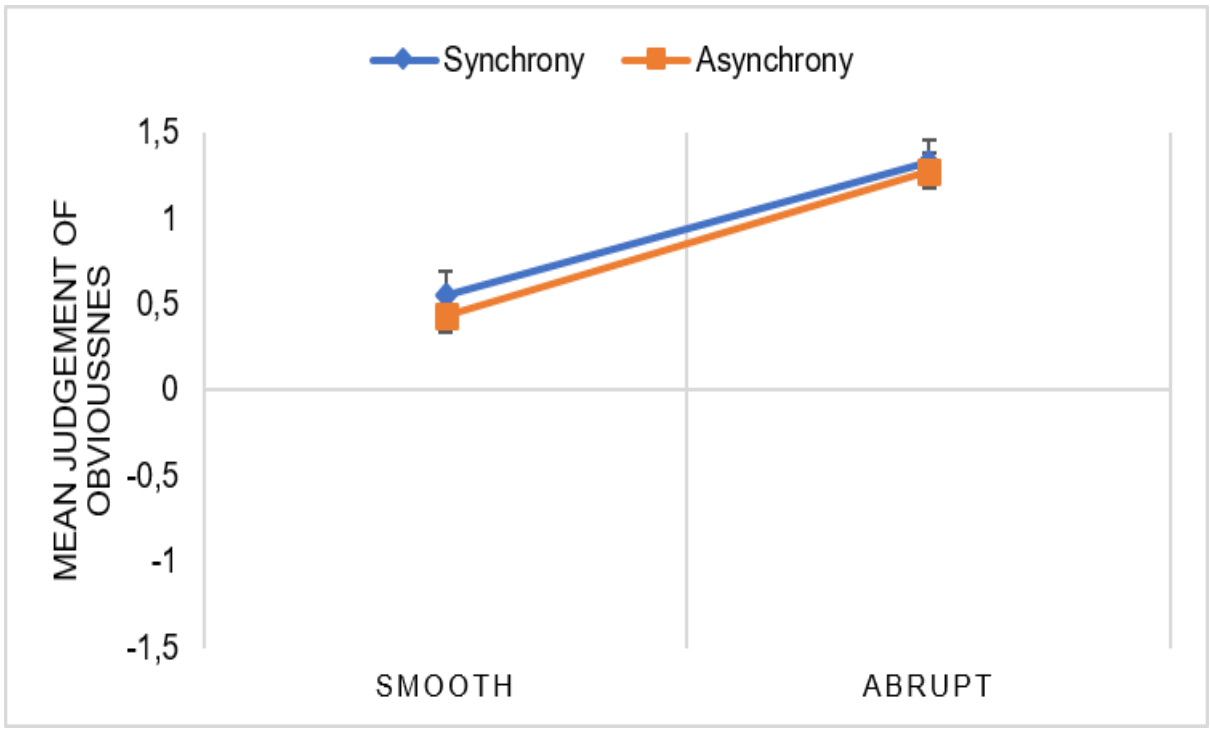

Figure 4.4. Judgement of obviousness for movement continuation and synchrony. Error bars represent SEM.

4.3.8 Influence of Continuation and Synchrony on Judgement of Happiness

The interaction effect between continuation and synchrony regarding judgement of happiness was not significant, Wilks' Lambda = .99, F (1, 29) = .20, $p > .05$.
The main effect of continuation on judgement of happiness was significant, Wilks' Lambda = .73, F (1, 29) = 10.84, $p < .05$, partial eta squared = .27. Surprisingly, abrupt movements were perceived as happier than smooth movements (see figure 4.5). The main effect of synchrony on judgement of happiness was significant, Wilks' Lambda = .80, F (1, 29) = 7.36, $p < .05$, partial eta squared = .20. Synchronous movements were perceived as happier than asynchronous movements. Movements were rated from the happiest to the least happy as follows: abrupt synchrony, abrupt asynchrony, smooth synchrony, smooth asynchrony.

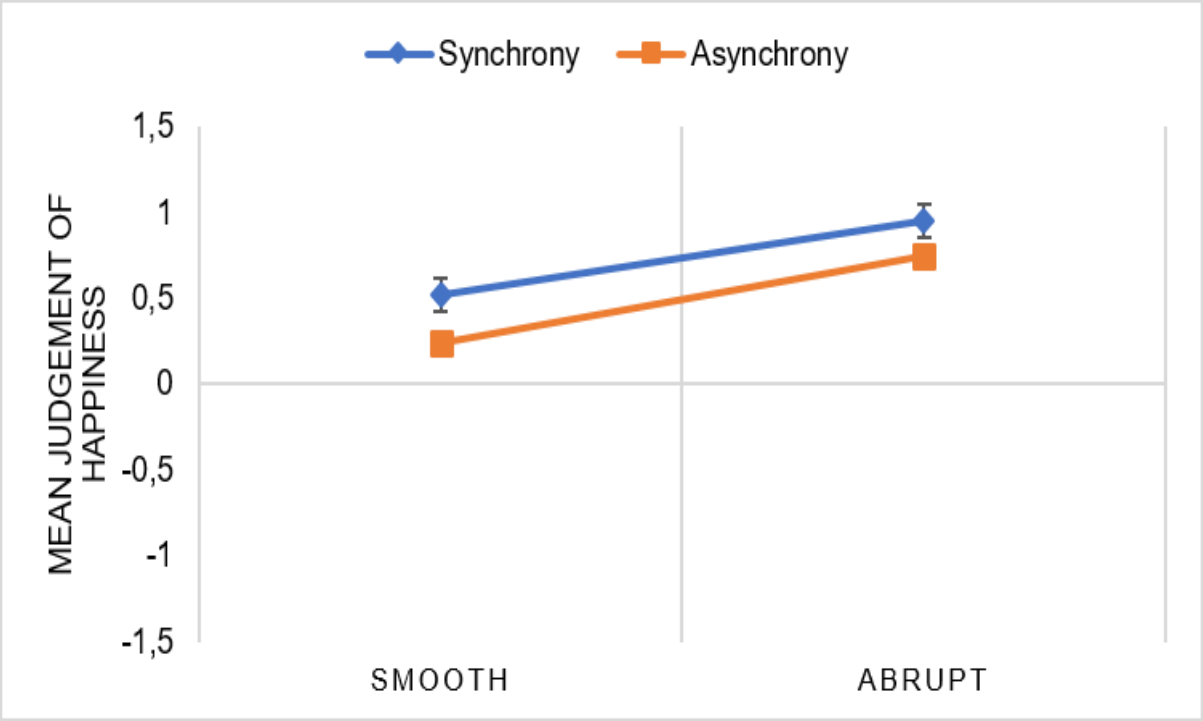

Figure 4.5. Judgement of happiness for movement continuation and synchrony. Error bars represent SEM.

4.3.9 Correlations as Precondition for Predictors of Mean Liking Judgements

Since one of the statistical assumptions of multiple hierarchical regression is a correlation between predictor and outcome variables, the following correlations were performed as a precondition for the multiple hierarchical regression to establish the variables that are predictors of mean liking judgements. Mean liking judgement and the rest of mean aesthetic judgements were computed from the overall mean score of all the aesthetic judgements from all the smooth/abrupt and synchronous/asynchronous video animations. A Pearson's correlation was performed. Mean liking judgement significantly correlated with mean judgement of happiness, familiarity, and control. Mean liking judgement was not significantly correlated with mean judgement of arousal, variety, diversity, nor obviousness (see table 4.1).

Table 4.1. Correlations for Mean Liking Judgement and the Different Subscales.

	Mean Liking Judgement
Variety	.30
Familiarity	.52*
Happiness	.64**
Control	.37*
Obviousness	.09
Arousal	.18
Diversity	.11

Note. Pearson's correlations.

n = 30.

**p < .05, **p < .001, two-tailed.*

4.3.10 Predictors of Mean Liking Judgements

In order to statistically control the potential influence of demographic variables such as gender, age, dance experience, and dance exposure, a hierarchical multiple regression (see table 4.2) tested whether judgement of happiness, familiarity, and control were significant predictors of mean liking judgements after controlling the influence of gender, age, dance exposure (if participants were frequent visitors of dance performances), and dance experience (if respondents had received professional dance training). In step 1, the variables gender, age, dance exposure, and dance experience were entered. These control variables explained 14% of the variance in general aesthetic preference. In step 2, all the variables were entered: the control variables (gender, age, dance exposure, dance experience) and the predictor variables (judgement of happiness, familiarity and control). This whole model predicted 66% of the variance in mean liking judgements, F (7, 21) = 5.76, p < .05. The predictor variables (judgement of happiness, familiarity and control) explained 51% of the variance in mean liking judgements, after the statistical effect of gender, age, dance exposure and dance experience was controlled, R squared changed = .51, F change (3, 21) = 10.51, p < .001. Finally, the second model showed that judgement of happiness (*beta* = .60, p < .001) was a significant predictor of mean liking judgement.

Table 4.2. Hierarchical multiple regression.

	B	**SE B**	**β**
Step 1			
Gender	.08	.85	.02
Age	.24	.20	.25
Frequent visitor	.11	.40	.05
Training	.42	.38	.22
Step 2			
Happiness	.70	.16	.60*
Familiarity	.27	.14	.28
Control	.02	.14	.02

Note: R^2 = .14 for Step 1, ΔR^2 = .51 (p < .001). *p < .001.

4.3.11 Additional Correlations

In order to analyse apparent contradictory findings between the regression and the ANOVA, additional correlations were conducted. Despite the regression analysis showed that judgement of happiness was a significant predictor of mean liking judgement, the ANOVA showed that the favourite condition (smooth synchrony) was not perceived as the happiest. Instead, the happiest was abrupt synchrony. Nevertheless, a two-tailed Pearson's correlation showed that judgement of happiness emitted for smooth synchrony significantly correlated with liking judgement emitted for smooth synchrony ($r = .589$, $n = 30$, $p < .05$). The same significant correlation was found for liking and happiness ratings regarding the abrupt synchrony condition ($r = .603$, $n = 30$, $p < .001$), confirming that, in general, judgement of happiness is a significant predictor of mean liking judgement.

Since the correlation was slightly stronger for abrupt synchrony, this could mean that non-expert participants rely slightly more on judgements of happiness to judge how much they like abrupt synchrony. However, this inference comes from correlations and could be explored in future studies that are beyond the scope of this research. It is worth noting again that here the purpose of the hierarchical multiple regression was to statistically control the potential influence of demographic variables such as gender, age, dance experience, and dance exposure.

4.3.12 Open-Ended Questionnaire

The open-ended questionnaire was used to double-check whether three of the eight semantic differential scales were clear or too abstract for novice participants. In general, most of the 14 participants that filled the printed open-ended questions validated the notion that the three semantic differential scales were clear to non-expert dance observers. In sum, the majority associated "obvious", "familiar" and "controlled" to higher fluency, and "subtle", "unfamiliar" and "accidental" to lower fluency. 13 participants associated the continuum subtle-obvious to the degree of clarity of movements, and one participant defined it in terms of emotional states. All 14 participants associated the relationship unfamiliar-familiar with not having seen or having seen similar movements in everyday life and/or during the experiment. The 14 participants associated accidental-control to the degree of perceived order.

4.4. Discussion

The present experiment applied the method of choice to test whether non-experts prefer higher fluency stimuli. Again, results were in line with the neurocognitive model of dance appreciation (Orgs et al., 2016) and with previous aesthetic theories such as mere exposure effect (Zajonc, 1968), Gestalt (Arnheim, 1974), prototypicality (Martindale & Moore, 1988) and processing fluency theory (Reber et al., 2004), supporting the hypothesis that non-experts like to watch smooth movements (hypothesis 1). Also, as expected, participants preferred movements that were judged as calm, controlled, repeated, uniform and familiar (supporting hypothesis 2). In more general terms, since it can be interpreted that synchrony and smoothness are less complex than asynchrony and abruptness (Berlyne, 1970, 1972), our results can be understood initially as the preference for simplicity over complexity. This contrasts with the inverted-U shape pattern in which participants prefer intermediate levels of complexity when listening piano compositions (Heyduk, 1975). However, we did not find a preference for intermediate complexity because the smooth movements performed in synchrony were more familiar as well, and possibly there was a familiarity effect which increased liking for simplicity. The latter interpretation agrees with findings from research about preference for pop music, in which participants preferred familiar to unfamiliar stimuli (North & Hargreaves, 1997).

Abrupt movements performed in synchrony were perceived as happier and more obvious than smooth movements performed in synchrony. Specifically, synchrony was perceived as happier than asynchrony. However, it is surprising and unexpected that abrupt movements were perceived happier than smooth movements. Such result could be explained by considering judgements of arousal. Since abrupt movements (synchronous and asynchronous) were the most exciting for the participants, these movements were perceived as the happiest as well. If we consider that western cultures tend to associate higher arousal with happiness (Tsai, et al., 2007), this might imply a cultural bias that is driving aesthetic perception of arousal and happiness when judging human movement, meaning that western participants might associate exciting movements with happy movements (instead of associating calm movements with happy movements). For now, this question cannot be fully addressed here because, in the current experiment, most of the participants

were from western countries. However, this cultural hypothesis will be addressed later in our cross-cultural experiment.

Previous research has associated positive valence to liking judgement and high arousal to interestingness (Berlyne, 1974; Christensen et al., 2014; Orgs et al., 2016). Our findings show that this is the case for perception of body video animations as well, since we found that positive valence (judgement of happiness) is associated to liking judgement, while judgement of arousal is not.

Another interesting finding was that synchronous and asynchronous movements were similarly obvious for participants. This could be interpreted as participants focusing in individual movements performed by each dancer, rather than participants trying to appreciate the collective synchronous performance from two dancers. Again, one possible explanation could reside in cultural factors that may influence appreciation styles that emphasise perception of individual actions. For instance, previous research on visual arts found that Western participants focus in details of aesthetic objects, while Eastern participants appreciate the aesthetic object as a whole (Masuda & Nisbett, 2001; Miyamoto et al., 2006). As mentioned before, a cultural hypothesis will be explored later in the cross-cultural study. Meanwhile, before continuing with the cross-cultural hypothesis, it is worth comparing findings from the method of production and findings from the method of choice.

If we compare the results from the present study (study 4), which applied the method of choice, and results from studies 1 and 2, which applied the method of production, we can see a consistent pattern in aesthetic preference for smooth movements across the method of production and the method of choice. In studies 1 and 2, participants produced higher continuation (or higher smoothness) for sequences of movements they would like to see. Congruently, in study 4, participants liked watching smooth movements. This means that these findings are not exclusive to one method or the other, but that they reflect a general tendency in novices to like to watch smooth human movement. However, since the present experiment showed human body animations only, there is still one pending question from the experiments that applied the method of production: participants expressed favouritism for human body animations over abstract shapes, will this preference be

the same when applying the method of choice? This question will be addressed in the next chapter.

CHAPTER 5

STUDY 4: AESTHETIC PERCEPTION OF ABSTRACT AND HUMAN BODY ANIMATIONS

5.1 Introduction

The previous three experiments showed that non-experts prefer smooth and symmetrical movements. The studies that applied the method of production (sequence production experiment, production of animations experiment) compared preference for human body images and abstract shapes, but this hypothesis was not tested in the previous study that applied the method of choice, because it displayed human body video animations only. For this reason, the present chapter will cover an experiment that applies the method of choice to test if there are differences between aesthetic perception of abstract and human body animations.

The present experiment is a follow-up study to the previous experiment because it is based on the design of the preceding study, where participants rate video animations. Also, it is a follow-up to the production of animations experiment because it compares preference for human body and abstract animations. Again, to keep a simple design, smooth synchrony and abrupt asynchrony were selected as conditions because those video animations influenced opposite trends in the previous chapter. In this way, these two conditions are helpful to compare results from the current experiment with findings from the previous study.

In the general introduction and in the previous experiments introductions as well, we emphasised the importance of studying perception of smooth motion and synchronous human movement from the perspective of psychology of aesthetics. As we said there, it is essential to study fluency preference, and to test predictions of the neurocognitive model of dance appreciation (Orgs et al., 2016). Accordingly, if novices assume low cognitive effort strategies, it is expected they would like to watch smooth synchrony, and would dislike abrupt asynchrony.

However, in study 3, we presented human body video animations only. One of the advantages of doing so, is that participants watched four conditions of human movement only (smooth synchrony, smooth asynchrony, abrupt synchrony, abrupt

asynchrony), which gave us the opportunity to analyse a detailed interaction between movement continuation and synchrony. The present study will take two of those conditions that showed opposite trends (smooth synchrony, abrupt asynchrony), and will present abstract and human body animations as well. This will help us to compare the aesthetic effects of abstract animations against body movement. Since, in studies 1 and 2 we made that type of comparison between human body and abstract images, now we can contrast those effects from our first two studies with the effects we might find in the present experiment.

Another reason for comparing abstract and human body animations is that, as mentioned in studies 1 and 2, following past research that associated motor familiarity to aesthetic liking (Kirsch et al., 2015; Kirsch et al., 2013), and in accord with the embodied cognition framework (Glenberg & Kaschak, 2002; Glenberg et al., 2008), we expect participants will prefer to watch human body animations to abstract animations, because they could relate others' body movement to their own body movements.

In the previous chapter we explained the relevance of using semantic differential scales. As we said then, semantic differential helps us to measure different dimensions of meaning through a range of aesthetic judgements in relatively short time, in comparison with other type of scales (Osgood, 1957). To compare the studies 3 and 4, here we will use the same semantic differential scales from the previous chapter, as well as the same background questionnaire and procedure from the previous study. Since in study 3 we found participants understood the adjectives employed in the semantic differential scales, in the present experiment we will omit the open-ended questions that asked about their meaning.

Again, the present experiment will test the neurocognitive model of aesthetic appreciation in the performing arts (Orgs et al., 2016). According to this, we expect novices will like smooth synchrony, and will dislike abrupt asynchrony. Also, it is expected novices will prefer human body animations to abstract animations.

Hypothesis

Hypothesis 1. Participants will prefer smooth synchrony over abrupt asynchrony.

Hypothesis 2. Participants will prefer human body animations over abstract animations.

Hypothesis 3. Fluent and disfluent movements will be judged differently. Smooth synchrony will score higher on adjectives associated to higher fluency (calming, controlled, repeated, uniform, familiar, obvious, happy).

Hypothesis 4. Human body movement and abstract animations will be judged differently. Human body animations will score higher on adjectives associated to higher fluency (calming, controlled, repeated, uniform, familiar, obvious, happy).

5.2 Methods

5.2.1 Participants

Participants were first year psychology students from Brunel University (n = 19, 17 female), age range (18 – 20, *M* = 18.84, *SD* = .77). The initial sample was of 20 participants, but one participant was excluded due to computer malfunction during the experiment. 15 participants had no professional dance training, and 15 were not frequent visitors of dance performances. 17 participants were from the UK, one from Italy and one from Nepal. All participants were recruited through Brunel University's participant pool system and received course credits for participation.

5.2.2 Materials

As in the previous experiment, stimuli consisted of muted black and white video clips presenting four types of digital animations, now depicting two abstract shapes or two dancers (see figure 5.1). Frames were edited and presented as in the previous experiment, with the same characteristics of duration and orientation. Again, abstract images and body postures were the same as used in the sequence production experiment. For this experiment, two of the previous conditions were duplicated side by side (smooth synchrony and abrupt asynchrony), but now depicting two abstract shapes or two dancers. In this way, a 2 x 2 factorial within-subjects design manipulated the interaction between movement fluency (smooth synchrony, abrupt

asynchrony) and imagery (abstract animations, human body animations). Each human body video animation had an equivalent abstract animation depicting the same sequence. The resulting four conditions were:

1. Postural fluency: Both dancers performed the same posture at the same time, and the transition between one posture to the other was smooth (body postures performing smooth synchrony).

2. Abstract fluency: Both abstract shapes depicted the same position at the same time, and the transition between one position to the other was smooth (abstract shapes depicting smooth synchrony).

3. Postural disfluency: Dancers adopted different postures in each frame, and performed a sequence of abrupt movements (body postures performing abrupt asynchrony).

4. Abstract disfluency: Abstract shapes depicted different positions in each frame, and the transition between one position to the other was abrupt (abstract shapes depicting abrupt asynchrony).

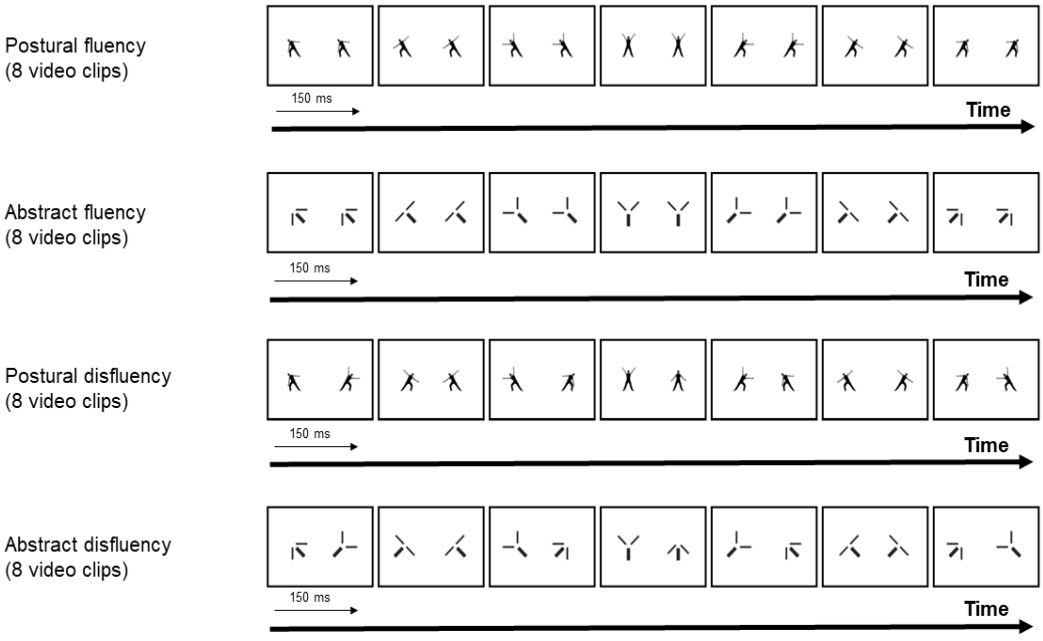

Figure 5.1. Example of frames used for abstract and human body video animations.

5.2.3 Measures and Procedure

The same semantic differential scales, background questionnaire and procedure from the previous study were applied to this experiment, omitting the open-ended questions.

5.3 Results

Two-way repeated measures ANOVA tested the influence of movement fluency (fluent, disfluent) and imagery (human body, abstract) on aesthetic perception. As mentioned in the previous experiment, these conditions (fluent/disfluent; body/abstract) were within subject. Therefore, two-way repeated measures ANOVA were selected to test such influence.

5.3.1 Influence of Movement Fluency and Imagery on Aesthetic Preference

The interaction effect between movement fluency and imagery regarding aesthetic preference was not significant, Wilks' Lambda = .91, F (1, 18) = 1.79, $p > .05$. Fluent movements were preferred over disfluent movements for both postural and abstract animations. The main effect of movement fluency on mean liking judgement was significant, participants liked fluent movements and disliked disfluent ones, Wilks' Lambda = .594, F (1, 18) = 12.32, $p < .05$, partial eta squared = .41. The main effect of imagery on mean liking judgement was not significant, participants liked human body animations and abstract animations in similar ways (see figure 5.2), Wilks' Lambda = .91, F (1, 18) = 1.77, $p > .05$.

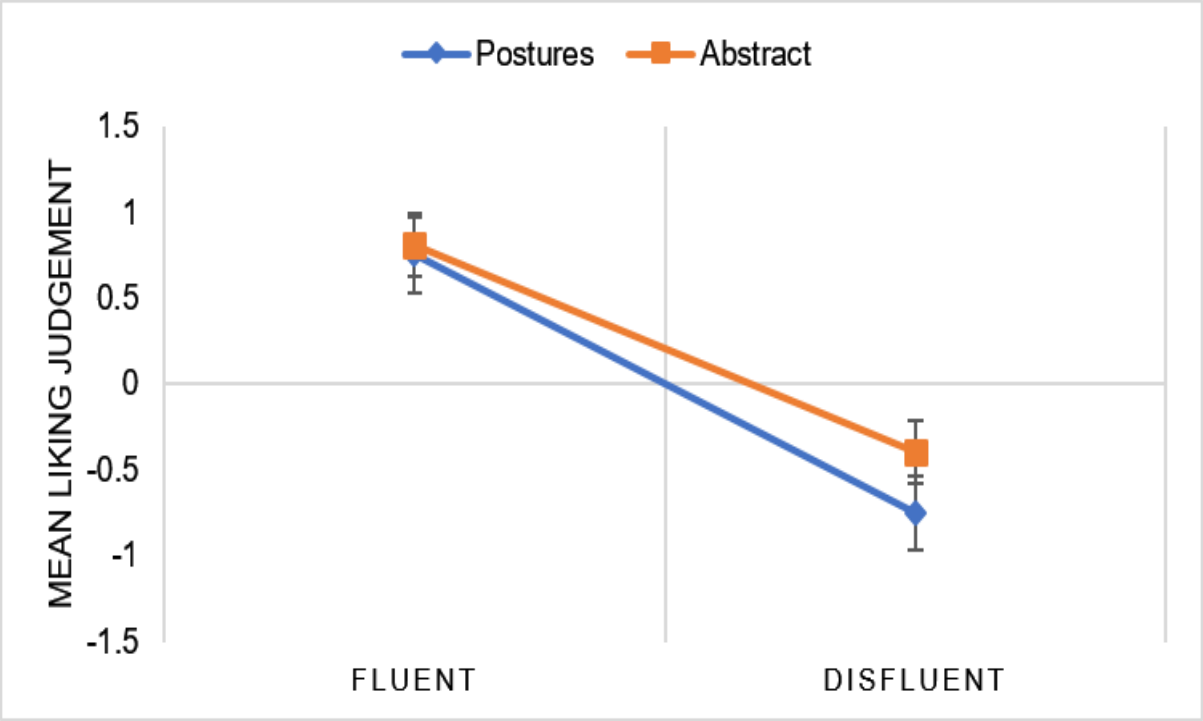

Figure 5.2. Aesthetic preference for movement fluency and imagery. Error bars represent SEM.

5.3.2 Influence of Movement Fluency and Imagery on Judgement of Arousal

In this dataset, as in the previous experiment, this was the only significant interaction effect. The interaction between movement fluency and imagery regarding judgement of arousal was significant Wilks' Lambda = .50, F (1, 18) = 18.25, $p < .001$, partial eta squared = .50. In general, disfluent movements were perceived as more exciting for both human body and abstract animations. However, human body animations scores were extreme in comparison with abstract animations (see figure 5.3). Abstract fluency was more exciting than postural fluency, and postural disfluency was more exciting than abstract disfluency.

The main effect of movement fluency on judgement of arousal was significant, where disfluent movements were perceived as more exciting than fluent movements, Wilks' Lambda = .38, F (1, 18) = 29.40, $p < .001$, partial eta squared = .62. The main effect of imagery on judgement of arousal was not significant, Wilks' Lambda = .96, F (1, 18) = .71, $p > .05$.

Dependent t-tests confirmed significant simple effects. Postural disfluency (M = 1.05, SD = .74) was more exciting than abstract disfluency (M = .63, SD = .90), t(18) = -2.74, $p < .05$, r = .54. In addition, Postural fluency (M = -1.28, SD = .89) was more calming than abstract fluency (M = -.66, SD = .96), t(18) = 3.59, $p < .05$, r = .65

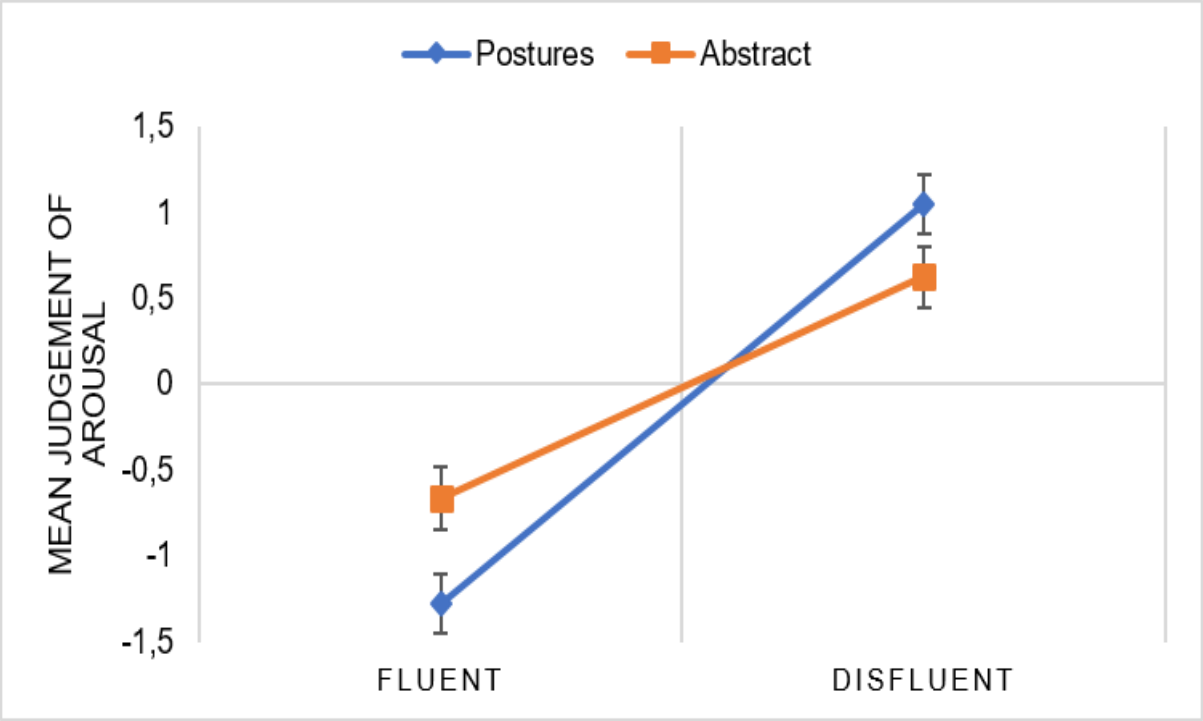

Figure 5.3. Judgement of arousal for movement fluency and imagery. Error bars represent SEM.

5.3.3 Influence of Movement Fluency and Imagery on Judgement of Control

The interaction effect between movement fluency and imagery regarding judgement of control was not significant, Wilks' Lambda = .98, F (1, 18) = .38, p > .05. The main effect of movement fluency on judgement of control was significant, Wilks' Lambda = .19, F (1, 18) = 75.65, p < .001, partial eta squared = .81. Fluent movements were perceived as more controlled than disfluent ones. The main effect of imagery on judgement of control was not significant, Wilks' Lambda = .95, F (1, 18) = .92, p > .05.

5.3.4 Influence of Movement Fluency and Imagery on Judgement of Variety

The interaction effect between movement fluency and imagery regarding judgement of variety was not significant, Wilks' Lambda = .99, F (1, 18) = .17, p > .05. The main effect of movement fluency on judgement of variety was significant, Wilks' Lambda = .23, F (1, 18) = 61.25, p < .001, partial eta squared = .77. Disfluent movements were perceived as more varied than fluent movements. The main effect of imagery on judgement of variety was not significant, Wilks' Lambda = 1.00, F (1, 18) = .01, p > .05.

5.3.5 Influence of Movement Fluency and Imagery on Judgement of Diversity

The interaction effect between movement fluency and imagery regarding judgement of diversity was not significant, Wilks' Lambda = .90, F (1, 18) = 2.00, p > .05.
The main effect of movement fluency on judgement of diversity was significant, Wilks' Lambda = .32, F (1, 18) = 38.16, p < .001, partial eta squared = .68. Disfluent movements were perceived as more diverse than fluent movements. The main effect of imagery on judgement of diversity was not significant, Wilks' Lambda = .99, F (1, 18) = .13, p > .05.

5.3.6 Influence of Movement Fluency and Imagery on Judgement of Familiarity

Non-normal distribution of mean judgement of familiarity was normalised using the reflect and logarithm transformation. Since the original data and the transformed variable showed congruent results, original values are reported followed by transformed values.

The interaction effect between movement fluency and imagery regarding judgement of familiarity was not significant, Wilks' Lambda = .92, F (1, 18) = 1.60, p > .05. The main effect of movement fluency on judgement of familiarity was significant, Wilks' Lambda = .30, F (1, 18) = 41.47, p < .001, partial eta squared = .70. Fluent movements were more familiar than disfluent ones. The main effect of imagery on judgement of familiarity was not significant, Wilks' Lambda = 1.00, F (1, 18) = .05, p > .05.

Results from transformed data were as follows: Interaction effect between movement fluency and imagery regarding judgement of familiarity (Wilks' Lambda = .93, F (1, 18) = 1.39, p > .05), main effect of movement fluency on judgement of familiarity (Wilks' Lambda = .27, F (1, 18) = 47.60, p < .001, partial eta squared = .73), main effect of imagery on judgement of familiarity (Wilks' Lambda = .96, F (1, 18) = .70, p > .05).

5.3.7 Influence of Movement Fluency and Imagery on Judgement of Obviousness

None of the interaction/main effects were significant: Interaction effect between movement fluency and imagery regarding judgement of obviousness (Wilks' Lambda = .91, F (1, 18) = .1.84, p > .05), main effect of fluency on judgement of obviousness, (Wilks' Lambda = .85, F (1, 18) = 3.12, p > .05), main effect of imagery on judgement of obviousness (Wilks' Lambda = 1.00, F (1, 18) = .06, p > .05).

The main effect of movement fluency on judgement of obviousness had a p value closer to a significant result and presented a small effect size as well (p = .094, partial eta squared = .148).

5.3.8 Influence of Movement Fluency and Imagery on Judgement of Happiness

None of the interaction/main effects were significant: Interaction effect between movement fluency and imagery regarding judgement of happiness (Wilks' Lambda = .92, F (1, 18) = 1.53, p > .05), main effect of fluency on judgement of happiness, (Wilks' Lambda = .83, F (1, 18) = 3.67, p > .05), main effect of imagery on judgement of happiness (Wilks' Lambda = 1.00, F (1, 18) = .19, p > .05).

The main effect of movement fluency on judgement of happiness had a p value closer to a significant result and presented a small effect size as well ($p = .071$, partial eta squared = .169).

5.4 Discussion

This experiment tested the influence of movement fluency and imagery on aesthetic perception in non-expert observers. The hypothesis that participants would prefer fluent movements was supported (Hypothesis 1). However, the hypothesis that human body animations would be preferred (Hypothesis 2) was not supported because there were no significant differences in liking judgement between abstract animations and body animations.

These findings are in line with results from the first two experiments that applied the method of production: participants prefer smooth movements over abrupt movements, but there are no significant differences between abstract and body posture scores. Also, these results are in line with the previous experiment, because participants prefer smooth synchrony over abrupt asynchrony.

In the same line, participants' aesthetic judgements, excepting judgement of obviousness and happiness, supported the hypothesis of differences between fluent and disfluent movement (Hypothesis 3). Judgements of obviousness and happiness showed results closer to significant p values and presented small effect sizes, but it is possible that they were not significant due to a small sample size. For judgement of happiness, the pattern was in the expected direction, but it was not significant; for obviousness, it was unexpected, but not significant either.

The hypothesis of differences among abstract and body animations (Hypothesis 4) was supported by the interaction between movement fluency and imagery regarding judgement of arousal. Postural fluency was perceived as more calming than abstract fluency. In turn, postural disfluency was judged as more exciting than abstract disfluency. This interaction evidences the aesthetic impact of human body in motion: in comparison to abstract animations, human body animations are more calming when fluent, and more exciting when disfluent.

However, this was not the case for the other scales of aesthetic judgement, which showed no significant differences between abstract and human body animations.

Our finding of stronger aesthetic effects of human body movement regarding judgement of arousal is in line with previous findings in motor simulation (Cracco, De Coster, Andres, & Brass, 2015) and kinesthetic empathy (Jola, Ehrenberg, & Reynolds, 2012), supporting the idea that seeing other's human movements activates internal representations of observer's own body actions (Cracco et al., 2015; Jola et al., 2012), and that this effect is stronger for the observation of human motion in comparison to non-human motion (Cracco et al., 2015; Jola et al., 2012). Considering this, it could be possible to interpret that, in study 4, human body video animations elicited stronger motor representations, and that aesthetic judgement of arousal was a particularly sensitive scale to detect semantic associations linked to the activation of motor representations. Further research could test this interpretation by applying measures of motor activity as in the imitation paradigm (Cracco et al., 2015) in conjunction with measures of aesthetic response.

As mentioned in the production of animations experiment, it is possible that participants had enough time to watch the video clips, being able to appreciate those movements, which in shorter time would be more difficult to accomplish when seeing abstract videos. Possible explanations regarding the absence of significant differences between abstract scores and postures scores in both method of production and method of choice will be further addressed in the general discussion.

In summary, findings from these four experiments evidence that non-experts: 1) Prefer high fluency movements (symmetrical, smooth, synchronous); 2) Like sequences created with human body images when watching static pictures; 3) Appreciate human body and abstract animations (apparent motion) in similar, yet not identical, ways.

The next chapter will present a cross-cultural experiment to test the psychosocial hypothesis described in the general introduction and in the previous study: that aesthetic perception of human movement is mediated by cultural factors.

CHAPTER 6

STUDY 5: AESTHETIC PERCEPTION OF SYNCHRONOUS DANCE IN JAPAN AND THE UK

6.1 Introduction

Studies 3 and 4 identified the powerful effects of synchronous movement on aesthetic perception, as well as the general introduction and study 3 posed the question of whether perception of synchronous movement is mediated by cultural factors. Previous studies have found differences between Western and Eastern societies regarding preference for abstract shapes (Kim & Marcus, 1999), aesthetic preference for art and photography (Masuda et al., 2008) and aesthetic perception of dance (Kahle, 2014). However, previous findings could not support the main hypothesis that individualistic cultures (USA) prefer asynchronous dance and collectivistic cultures (India) prefer synchronous dance, possibly because the Indian sample was not collectivistic enough (Kahle, 2014). Instead, that study found that Indian participants scored higher in both aesthetic preferences for synchronous and asynchronous dance in comparison to the US participants (Kahle, 2014). The present experiment tries to overcome some of those methodological limitations to examine cultural differences between individualistic and collectivistic societies regarding aesthetic perception of dance.

There were methodological differences between the previous study with US and Indian samples (Kahle, 2014) and the present experiment with British and Japanese respondents. Kahle (2014) used four semantic differential scales, six asynchronous videos and six synchronous videos. Also, the present experiment added the Need Inventory of Sensation Seeking. While the previous experiment paid respondents for their participation through Amazon MTurk and draw a lottery for other volunteers recruited on social media as well, the present experiment used the incentive of the lottery only.

In the context of the present thesis, the present cross-cultural study will apply the method of choice to compare its findings with those from studies 3 and 4, which also applied the method of choice. For the same reason, we will use the same semantic

differential scales from the previous two chapters. Since in the present study participants will watch actual dance videos, this will be closer to watching live performing arts, representing more ecological validity in comparison to studies 3 and 4, which presented schematic animations.

As we have seen through the present thesis, so far, theoretically and empirically, synchronous and asynchronous movement conveys powerful and distinct aesthetic meanings. In addition, previous research has linked synchronous human behaviours to sociocultural aspects such as cooperation (Wiltermuth & Heath, 2009) and social bonding (Tarr et al., 2015). This intersection between synchrony, society, and culture, poses the question of whether aesthetic perception of synchronous dance is universal or whether it is mediated by cultural factors. In other words, if synchronous human behaviour has psychosocial implications, it is valid to ask whether aesthetic appreciation of synchronous human movement has psychosocial implications as well.

In the general introduction we noted that two of the most relevant psychosocial variables that we can study to account for differences across cultures are individualism and collectivism (Hofstede, 1984, 2001; Hofstede et al, 2010; Triandis, 1995). There is a strong body of research on these two variables, which has showed validity and reliability in their findings, supporting the notion that individualistic or collectivistic values influence other spheres of psychological life, such as motivations (Vu, Finkenauer, Huizinga, Novin, & Krabbendam, 2017), behaviours (Vu et al., 2017) and preferences (Kim & Marcus, 1999; Masuda et al., 2008). For this reason, as explained in the general introduction, we will use the individualism/collectivism theory (Triandis, 1995) to underpin our theoretical model of cultural differences in aesthetic perception of dance. Individualistic cultures value the individual/singular over the group/communal, whereas collectivistic cultures value the group/communal over the individual/singular (Vu et al., 2017). Western cultures have been characterised as individualistic, while Eastern societies have been described as collectivistic (Vu et al., 2017). Moreover, it has been found these cultural traits of individualism/collectivism affects how observers from different cultures perceive the environment (Masuda et al., 2008; Nisbett, 2003; Kitayama et al.,2006; Knight & Nisbett, 2007; Uskul et al., 2008). In this sense, we expect persons from individualistic cultures will be motivated by need for uniqueness and sensation

seeking because these traits emphasise singular experiences, whereas persons from collectivistic societies will be motivated by conformity because it highlights communal aspects of a society.

In the present cross-cultural study, we recruited participants from Japan and the UK, because each of these two countries scores higher in collectivism and individualism, respectively (Hofstede et al., 2010). Since synchronous dance emphasises collective aspects of movement (dancers are doing the same movements at the same time), and asynchronous dance emphasises individual aspects of movement (a group of dancers doing different movements individually), our proposed cultural model predicts that aesthetic preference for synchronous dance will be mediated by collectivism and conformity in the Japanese sample, whereas aesthetic preference for asynchronous dance will be mediated by individualism, need for uniqueness, and sensation seeking in the British sample.

Finally, we applied a background/demographic questionnaire to account for possible intervenient variables, such as level of dance expertise, and to ensure participants have the cultural background from one of the populations we want to study.

Hypothesis

In line with the cultural model that was proposed in the general introduction, the following hypothesis are formulated:

Hypothesis 1: British participants will prefer asynchronous dance scenes and Japanese participants will prefer synchronous dance scenes.

Hypothesis 2: There will be significant differences in the way British and Japanese participants aesthetically judge synchronous and asynchronous dance.

Hypothesis 3: The aesthetic judgements exciting, varied, accidental, diverse, unfamiliar, obvious, and happy will be predictors of mean liking judgement in British participants. The aesthetic judgements calming, repeated, controlled, uniform, familiar, subtle and sad will be predictors of mean liking judgement in Japanese participants.

Hypothesis 4: Aesthetic preference for asynchronous dance in British participants will be mediated by individualism, need for uniqueness, and sensation seeking. Aesthetic preference for synchronous dance in Japanese participants will be mediated by collectivism and conformity.

6.2 Methods

6.2.1 Participants

6.2.1.1 British sample.

The UK version of the online survey was advertised on social networks, specialised websites and by email. Incomplete surveys were excluded. Forty British respondents (31 female) with age ranged from 18 to 71(M = 28.47, SD = 13.63) participated in the study. All British participants were born and raised in the UK with both parents also born and raised in the UK. Ten participants reported that they had previous professional dance training whereas 30 participants had no professional dance training. Eleven participants reported being frequent visitors of dance performances, but 29 were infrequent visitors of dance performances. Participation was voluntary. One £50 Amazon gift card was drawn every 30 respondents as an incentive for participation.

6.2.1.2 Japanese sample.

The Japanese version of the online survey was advertised on the Participant Pool website of Kobe University. Fifty Japanese respondents (29 female, 1 missing value) with age ranged from 18 to 22 (1 missing value, M = 19.65, SD = 1.05) participated in the study. None of the Japanese participants had previous professional dance training and none of the participants reported being a frequent visitor of dance performances. One ¥5000 (Japanese Yen) Amazon gift card was drawn every 30 respondents as an incentive for participation.

6.2.2 Materials

Dance stimuli consisted of 20 muted black and white short video clips presenting synchronous and asynchronous choreographies from folk, classical, and contemporary dance (appendix 4). Clips showed between 6 to 100 dancers approximately. Videos were searched on Google and YouTube through snowball

sampling using keywords such as group dance, flash mobs, performances, opening ceremonies, closing ceremonies, synchronous movement, and asynchronous movement. The initial sample of 57 downloaded videos was reduced to 20 videos after excluding military parades, prop-based routines, and incidental product placement. The selected 10 synchronous videos and 10 asynchronous videos were muted, converted to black and white, and trimmed to last between 6 and 14 seconds. Synchronous and asynchronous videos were matched for performer race (Caucasian vs. Asian) to avoid a confounding influence of the performer's race on the participant's preference ratings (Coetzee, Greeff, Stephen, & Perrett, 2014; Danel et al., 2012).

6.2.3 Measures

6.2.3.1 Semantic differential scales.

As in studies 3 and 4, we used eight 7-point semantic differential scales to measure aesthetic ratings of the dance video clips. Participants were instructed to use the semantic differential scales to rate each dance video clip based on the dance movements they see in the videos, ignoring the clothes of the dancers or the background of each scene. There were 8 items below each video clip. The order of videos and semantic differential scales were randomised. We assessed the following concepts.

1. aesthetic evaluation (dislike – like);

2. arousal (calming – exciting);

3. variety (repeated – varied);

4. control (accidental – controlled);

5. diversity (uniform – diverse);

6. familiarity (unfamiliar – familiar);

7. obviousness (subtle – obvious);

8. happiness (sad – happy).

The semantic differential scales were used to measure participants' aesthetic judgement of each dance type (synchronous or asynchronous dance). The aesthetic

evaluation scale was used to measure aesthetic preference for synchronous or asynchronous dance. Since previous psychological and philosophical studies have proposed Eastern and Western cultures appreciate emotions in different ways (Keene, as cited in Odin, 2016; Odin, 2016; Tsai et al., 2007), we used arousal (calming – exciting) and happiness (sad – happy) scales to measure these constructs to detect potential differences in the way Japanese and British participants perceive emotions associated to each dance type. Variety (repeated – varied), diversity (uniform – diverse), control (accidental – controlled), and obviousness (subtle – obvious) scales were applied to assess participants' aesthetic judgement of synchronous/asynchronous movement's visual features. The familiarity scale (unfamiliar – familiar) tested whether participants were familiarised with the movements on display.

6.2.3.2 Individualism and collectivism scale.

It consists of a 7-point Likert scale with 14 items. This scale measures a cultural orientation of the individualism or collectivism of the participants (Sivadas, Bruvold, & Nelson, 2008, for the English version; Ohashi, 2006, for the Japanese version). An example item for individualism was "I enjoy being unique and different from others in many ways", and "My happiness depends very much on the happiness of those around me" was the example item for collectivism. To verify whether respondents were reading the questionnaires, catch items were included in the individualism/collectivism, need for uniqueness, and sensation seeking scales.

6.2.3.3 Uniqueness scale.

This scale measured need for uniqueness (Snyder & Fromkin, 1977). The Japanese version was taken from Okamoto (1985). It presented 32 items, each one to be rated with a 7-point Likert scale ranging from 1 = "strongly disagree" to 7 = "strongly agree". An example item of this scale was "I tend to express my opinions publicly, regardless of what others say".

6.2.3.4 Conformity scale.

This scale measured need for conformity (Mehrabian & Stefl, 1995). The Japanese version came from Yokota and Nakanishi (2011). It presented 11 items to be rated with a 7-point Likert scale extending from 1 = "strongly disagree" to 7 = "strongly

agree". An example item was "I tend to follow family tradition in making political decisions".

6.2.3.5 Need inventory of sensation seeking (NISS).

This scale measures motivation to engage in situations that induce high arousal (Need for Stimulation) and to evade situations that that induce low arousal (Avoidance of Rest) (Roth & Hammelstein, 2012). The English version was adopted from Roth and Hammelstein (2012). The scale was translated to Japanese and back-translated to English by two bilingual individuals to ensure the equivalent contents between the two versions. The NISS included 17 items to be rated with a 7-point Likert scale (1 = never, 7 = always) and comprised two factors (Need for Stimulation and Avoidance of Rest); an example item from the Need for Stimulation factor (NS) was "I like to find myself in situations which make my heart beat faster". Since the items from the Avoidance of Rest (AR) factor present a positive worded description of motivations towards intention to relax (e.g. "I like to take time out to relax"; "I enjoy when there's nothing for a while"), higher scores represent lower levels of AR. For this reason, this scale was reverse coded to obtain a direct interpretation of the results: higher scores of AR represent higher levels of AR.

6.2.3.6 Background questionnaire.

The background questionnaire asked for participants' demographic information, such as gender, age, nationality, ethnicity, whether the respondent has lived in another country different than the UK more than one year (for the British version), whether the respondent had lived in another country different than Japan more than one year (for the Japanese version), language spoken at home, whether the respondent had received professional dance training, number of years attending dance classes, kind of dance practiced, and whether the respondent was a frequent visitor of dance performances. Participants that lived more than one year abroad or that spoke a foreign language at home were excluded to increase sample representativeness. The demographic questions for nationality, ethnicity, and language spoken at home were not included in the Japanese version as all the students in Participant Pool of Kobe University were East Asians.

Conformity and individualism/collectivism scales were originally 9-point Likert scales, and the uniqueness scale was a 5-point Likert scale. However, all scales

were presented to participants as 7-point Likert scales, so respondents could answer more comfortably.

6.2.4 Procedure

Both the British and the Japanese versions of the online survey were created using Survey Monkey. The whole English version of the survey including all the information, scales and questionnaires was back translated to Japanese by two Japanese native speakers. The survey was programmed to randomise and counterbalance the items automatically and to keep a specific order for the general sections.

At the beginning of the experiment general information describing purpose of the survey was displayed. Then, 20 dance video clips (10 synchronous and 10 asynchronous dance movements) were randomly presented. Videos were presented one by one, and participants rated each dance scene using eight sematic differential scales that were below each one of the video clips. Semantic differential scales were also presented in randomised order.

Then, participants completed questionnaires about individualism/collectivism, need for uniqueness, conformity, sensation seeking and demographic information (background questionnaire). The survey ended with a debrief and the option to enter an email address to participate in the lottery. All participants signed informed consent. The study was approved by the ethical committees at Brunel University London and Goldsmiths, University of London**.**

6.3 Results

As in studies 3 and 4, we computed all the 7-point Likert scales as ranging from -3 to 3, meaning that a tendency towards negative values would represent proximity to one construct, while a positive tendency would represent proximity towards the opposite construct.

6.3.1 Aesthetic Judgement of Synchronous and Asynchronous Dance Videos

To assess cultural differences across all eight semantic differential scales, we conducted a 2 (Culture: UK, Japan) x 2 (Dance Type as within-subject variable: Synchrony, Asynchrony) mixed design factorial ANOVA for each of the eight semantic differential scales. Since culture was a between subject condition, and dance type was a within subject condition, a mixed design factorial ANOVA was selected to test such differences.

6.3.1.1. Cultural differences in aesthetic preference (dislike – like).

The interaction effect between Culture and Dance Type was significant (see figure 6.1), Wilks' Lambda = .95, F (1, 88) = 5.06, $p < .05$, $\eta_p^2 = .05$. In line with the predicted pattern, but not significant, Japanese participants preferred synchronous dance (M = .78, SD = .63) to asynchronous dance (M = .64, SD = .73), t(49) = 1.25, $p > .05$, whereas British participants preferred asynchronous dance (M = .79, SD = .86) to synchronous dance (M = .56, SD = .97), t(39) = 1.93, $p > .05$. The main between-subjects effect for culture and the main within-subjects effect for Dance Type were not significant, Wilks' Lambda = 1, Fs (1, 88) = .05, .30, $ps > .05$. To rule out possible in-group/out-group bias, 3 synchronous videos that showed Asian dancers were excluded from the mean scores of liking judgements from British and Japanese participants. After this filter, the same 2 x 2 mixed ANOVA was rerun and it showed that the crossover interaction was still significant, where Japanese participants preferred synchronous dance, and British respondents preferred asynchronous dance, Wilks' Lambda = .89, F (1, 88) = 10.57, $p < .05$, $\eta_p^2 = .11$. As predicted, Japanese participants significantly preferred synchronous dance (M = .95, SD = .61) to asynchronous dance (M = .64, SD = .73), t(49) = 3.08 , $p < .05$, r = .40, whereas British participants preferred asynchronous dance (M = .79, SD = .86) to synchronous dance (M = .59, SD = 1.01), t(39) = 1.63, $p > .05$, but without achieving a significant difference. Main within-subjects effect for aesthetic preference was not significant, Wilks' Lambda = .99, F (1, 88) = .52, $p > .05$. Main between-subjects effect for culture was not significant, F (1, 88) = .48, $p > .05$.

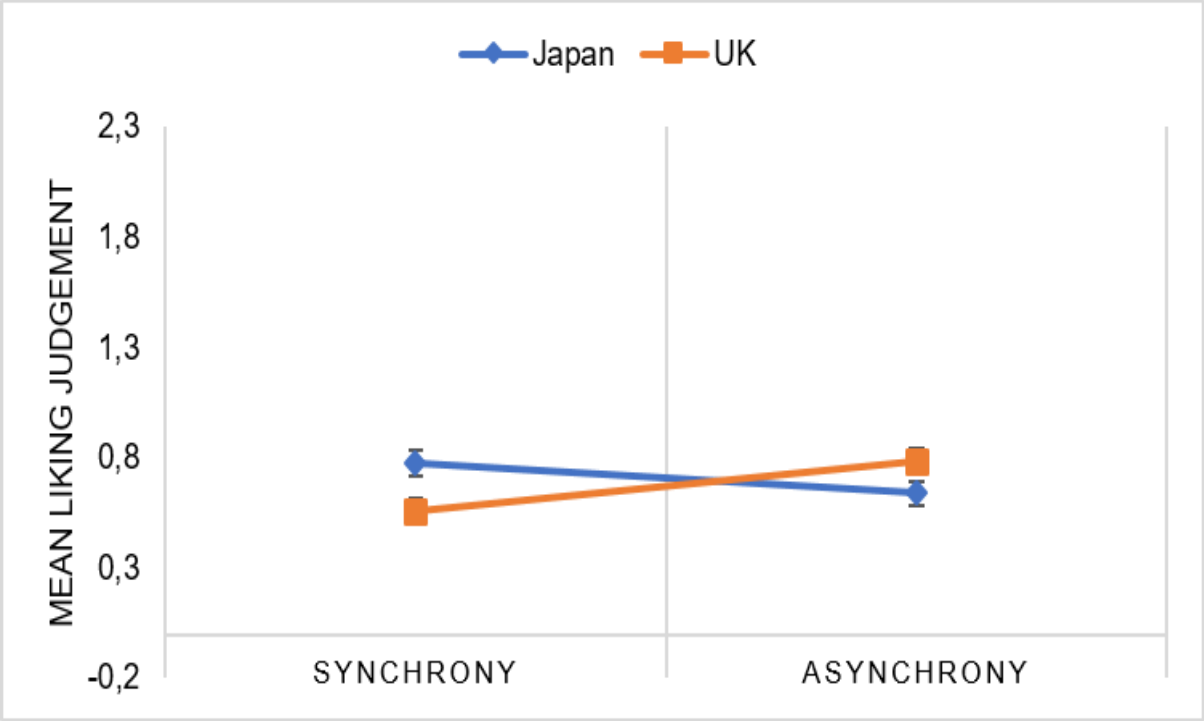

Figure 6.1. Cultural differences in aesthetic preference for synchronous and asynchronous dance. Error bars represent standard error of the mean.

6.3.1.2 Cultural differences in perception of arousal (calming – exciting).

Both groups perceived asynchronous dance as significantly more exciting than synchronous dance as indicated by the main effect of Dance Type, Wilks' Lambda = .47, F (1, 88) = 100.69, $p < .001$, $\eta_p^2 = .53$. At the same time, British respondents found both dances significantly more exciting compared to Japanese participants, F (1, 88) = 8.35, $p < .05$, $\eta_p^2 = .09$. The interaction effect between Culture and Dance Type was not significant, Wilks' Lambda = 1, F (1, 88) = .35, $p > .05$.

6.3.1.3 Cultural differences in perception of variety (repeated – varied).

The main effect of Dance Type was significant, Wilk's Lambda = .37, F (1, 88) = 155.3, $p < .001$, $\eta_p^2 = .64$, suggesting that participants perceived asynchronous dance as more varied than synchronous dance. The main between-subjects effect for Culture was not significant, F (1, 88) = .09, $p > .05$. The interaction effect between Culture and Dance Type was significant, Wilks' Lambda = .95, F (1, 88) = 4.40, $p < .05$, $\eta_p^2 = .05$.

Independent samples t-test showed that, when rating asynchronous dance, there were no significant differences in judgement of variety made by British (M = .64, SD = .99) and Japanese participants (M = .41, SD = .87), t(88) = 1.20, $p > .05$.

6.3.1.4 Cultural differences in perception of control (accidental – controlled).

Both groups perceived synchronous dance as controlled. In addition, British participants perceived the asynchronous dance as more controlled while Japanese participants perceived it as more accidental. The main within-subjects effect for Dance Type was significant, Wilks' Lambda = .15, F (1, 88) = 501.03, $p < .001$, $\eta_p^2 = .85$, with synchronous dance being perceived as more controlled than asynchronous dance. The main between-subjects effect for Culture was significant, F (1, 88) = 12.45, $p < .05$, $\eta_p^2 = .12$; British participants perceived overall dances as more controlled than did Japanese participants. The interaction effect between perception of control and culture was significant (see figure 6.2), Wilks' Lambda = .92, F (1, 88) = 8.17, $p < .05$, $\eta_p^2 = .09$.

Dependent t-tests showed significant simple effects. British participants perceived more control in synchronous dance (M = 2.31, SD = .49) than in asynchronous dance (M = .46, SD = .69), $t(39) = 12.43$, $p < .001$, $r = .89$. Also, Japanese participants perceived more control in synchronous dance (M = 2.27, SD = .62) than in asynchronous dance (M = -.13, SD = .63), $t(49) = 19.82$, $p < .001$, $r = .94$. An independent t-test showed that British participants perceived asynchronous dance as more controlled (M = .46, SD = .69) in comparison to Japanese participants (M = -.13, SD = .63), $t(88) = 4.2$, $p < .001$, $r = .41$.

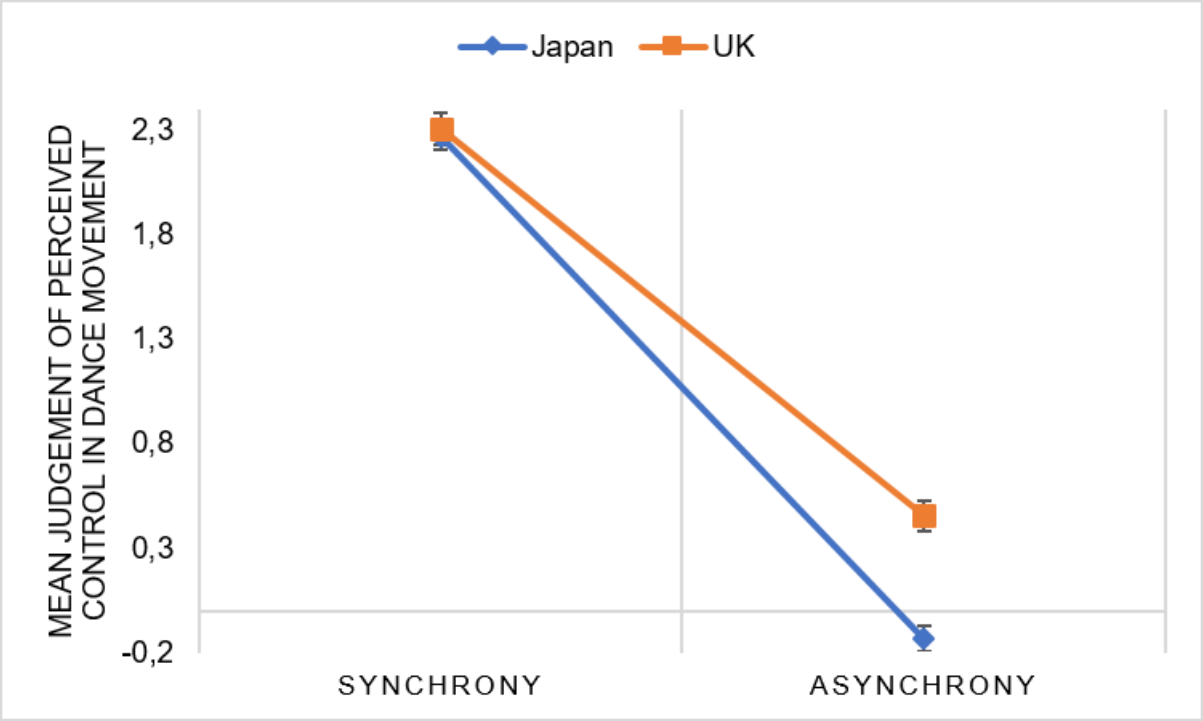

Figure 6.2. Cultural differences in perception of control. Error bars represent SEM.

6.3.1.5 Cultural differences in perception of familiarity (unfamiliar – familiar).

The main effect for Dance Type was significant, Wilks' Lambda = .69, F (1, 88) = 39.18, $p < .001$, $\eta_p^2 = .31$. Participants perceived the synchronous dance as more familiar than asynchronous dance. The main effect for Culture was significant, F (1, 88) = 17.99, $p < .001$, $\eta_p^2 = .17$. British participants perceived synchronous and asynchronous dance as more familiar in comparison to Japanese participants. The interaction effect between perception of familiarity and culture was not significant, Wilks' Lambda = 1, F (1, 88) = .45, $p > .05$.

6.3.1.6 Cultural differences in perception of obviousness (subtle – obvious).

The main effect for Dance Type was significant, Wilks' Lambda = .87, F (1, 88) = 13.50, $p < .001$, $\eta_p^2 = .13$. Synchronous dance was perceived as more obvious than asynchronous dance. The main between-subjects effect for culture was significant, F (1, 88) = 11.71, $p < .05$, = .12. British participants perceived dance movements as more obvious than did Japanese participants. The interaction effect between perception of obviousness and culture was significant (see figure 6.3), Wilks' Lambda = .866, F (1, 88) = 13.65, $p < .001$, $\eta_p^2 = .13$. Dependent t-tests showed significant simple effects for Japanese participants only. Japanese participants perceived more obviousness in synchronous dance (M = .94, SD = .69) than in asynchronous dance (M = .22, SD = .75), $t(49) = 4.71$, $p < .001$, r = .56. In contrast, British participants did not perceive significant differences in obviousness between synchronous (M = .96, SD = .75) and asynchronous dance (M = .97, SD = .59), $t(39) = .02$, $p > .05$. An independent t-test showed that British participants perceived asynchronous dance as more obvious (M = .97, SD = .59) in comparison to Japanese participants (M = .22, SD = .75), $t(88) = 5.11$, $p < .001$, r = .48.

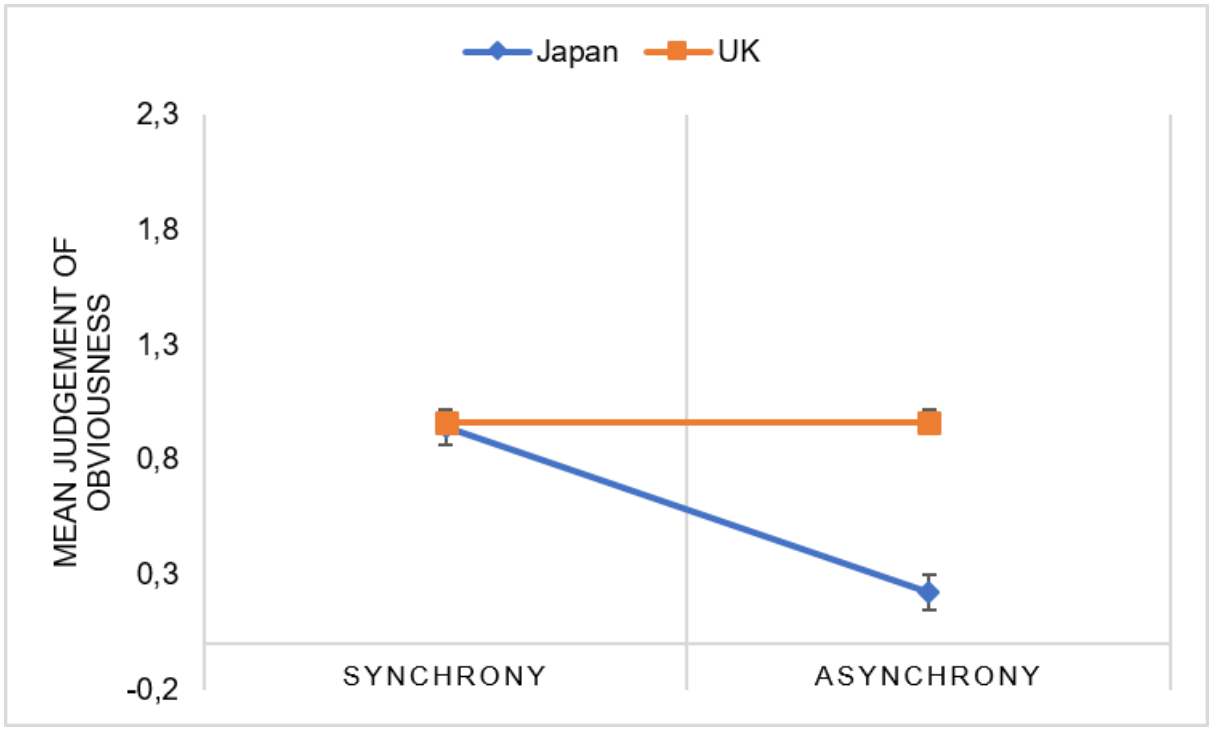

Figure 6.3. Cultural differences in perception of obviousness. Error bars represent SEM.

6.3.1.7 Cultural differences in perception of diversity (uniformed – diverse).

The main within-subjects effect for Dance Type was significant, Wilks' Lambda = .15, F (1, 88) = 514.84, $p < .001$, $\eta_p^2 = .86$, indicating that asynchronous dance was perceived as more diverse than synchronous dance. The main effect for Culture was not significant, F (1, 88) = 2.10, $p > .05$. The interaction effect between Culture and Dance Type was significant, Wilks' Lambda = .95, F (1, 88) = 4.20, $p < .05$, $\eta_p^2 = .05$. Independent samples t-test showed that, when rating synchronous dance, there were no significant differences in diversity judgements made by British (M = -1.70, SD = 1.28) and Japanese participants (M = -2.14, SD = .72), t(58.34) = 1.95, $p > .05$.

6.3.1.8 Cultural differences in perception of happiness (sad – happy).

Asynchronous dance was perceived as happier than synchronous dance in both groups, as indicated by the main effect of Dance Type, Wilks' Lambda = .88, F (1, 88) = 11.55, $p < .05$, $\eta_p^2 = .12$. The main effect for Culture was not significant, F (1, 88) = 3.52, $p > .05$. The interaction effect between Culture and Dance Type was also not significant, Wilks' Lambda = .98, F (1, 88) = 2.02, $p > .05$.

6.3.2 Individualism and Collectivism

We predicted that British participants would score higher in individualism and lower in collectivism while the Japanese participants would score higher in individualism and lower in collectivism. Cronbach's alpha was as follows: Individualism (UK α = .68; Japan α = .56), Collectivism (UK α = .79; Japan α = .59). An independent-samples t-test showed that there were not significant differences in individualism between British participants (M = .74, SD = 1.03) and Japanese participants (M = 1.10, SD = .92), t(88) = 1.74, $p > .05$. An independent t-test showed there were not significant differences in collectivism between the British sample (M = .62, SD = 1.08) and the Japanese sample (M = .67, SD = .72), t(88) = .26, $p > .05$. Therefore, individualism and collectivism were not included in further analysis.

6.3.3 Need for Uniqueness and Conformity

Cronbach's alpha was as follows: NU (UK α = .87; Japan α = .86), Conformity (UK α = .78; Japan α = .78). It was expected that the British participants would score higher in Need for Uniqueness (NU) and lower in Conformity while the Japanese participants would score higher in Conformity and lower in NU. An independent-samples t-test confirmed such expected differences. The British participants scored significantly higher in NU (M = .09, SD = .76) than the Japanese participants (M = -.29, SD = .68), $t(88) = 2.46$, $p < .05$, $r = .25$. Also, the Japanese participants scored significantly higher in Conformity (M = .24, SD = .85) than the British participants (M = -.53, SD = .86), $t(88) = 4.23$, $p < .001$, r = .41. Therefore, NU and Conformity were included in the mediation analysis as mediators.

6.3.4 Need Inventory of Sensation Seeking

Cronbach's alpha was as follows: NS (UK α = .90; Japan α = .87), AR (UK α = .75; Japan α = .80). It was expected that the British participants would score higher in Need for Stimulation (NS) and Avoidance of Rest (AR) than the Japanese participants. Independent samples t-tests were conducted to test such differences. Although no significant difference was found in NS between the British sample (M = .05, SD = 1.07) and the Japanese sample (M = .15, SD= .99) $t(88) = .43$, $p > .05$, the British participants scored significantly higher in AR (M = -.73, SD = 1.01) than the Japanese participants (M = -1.28, SD = 1.09) $t(88) = 2.44$, $p < .05$, $r = .25$. Therefore, AR was included in the mediation analysis as a potential mediator.

6.3.5 Mediation Analysis

The mediation analysis allows us to test both direct and indirect effects among a predictor and outcome variables, including the effects of mediating variables as well. For this reason, to test the hypothesis that the influence of culture on aesthetic preference for synchronous and asynchronous dance is mediated by Need for Uniqueness, Conformity and Avoidance of Rest, two simple mediation analyses were conducted with the bootstrapping technique. The mediation was analysed with the PROCESS plugin for SPSS (Hayes, 2013). We conducted two mediation analyses.

Firstly, we included separated measures for the outcome and mediator variables. Aesthetic preference for asynchronous dance, aesthetic preference for synchronous dance, Need for Uniqueness and Conformity were separated variables. Nevertheless, these models were not significant for the most relevant path that tests the influence of culture on aesthetic preference. To improve the statistical sensitivity of the test, the outcome variables were combined by the subtraction of aesthetic preference for synchronous dance minus aesthetic preference for asynchronous dance. The mediators were combined by the subtraction Need for Uniqueness minus Conformity. Higher scores in the combined aesthetic preference indicate preference for synchrony while lower scores represent preference for asynchrony. Higher scores in the combined Need for Uniqueness minus Conformity indicate higher levels of Need for Uniqueness and lower scores represent higher levels of Conformity. The combination of the variables improved statistical sensitivity, at least for the path that tests the direct influence of culture on aesthetic preference. Combined aesthetic preference will be reported as synch-asynch aesthetic preference. Combined Need for Uniqueness and Conformity will be noted as NU-Conformity.

The first mediation analysis tested whether Need for Uniqueness and Conformity (NU-Conformity) mediate cultural differences in aesthetic preference for synchronous and asynchronous dance (synch-asynch aesthetic preference). The first mediation analysis was not significant. It showed that culture significantly predicted synch-asynch aesthetic preference (path c = .37, $p < .05$); culture and NU-Conformity predicted synch-asynch aesthetic preference (path c' = .38, $p < .05$); and culture significantly predicted NU-Conformity (path a = -1.14, $p < .05$). However, NU-Conformity did not significantly predict synch-asynch aesthetic preference (path b = .01, $p > .05$).

The second mediation analysis tested whether Avoidance of Rest (AR) mediates cultural differences in aesthetic preference for synchronous and asynchronous dance (synch-asynch aesthetic preference). The second mediation analysis was not significant. Culture significantly predicts synch-asynch aesthetic preference (path c = .36, $p < .05$); culture and AR did not significantly predict synch-asynch aesthetic preference (path c' = .32, $p > .05$); culture significantly predicts AR (path a = -.55, $p < .05$); Finally, AR was not a significant predictor of synch-asynch aesthetic preference (path b = -.08, $p > .05$).

6.3.6 Correlations as Precondition for Predictors of Mean Liking Judgements

As mentioned in study 3, since one of the statistical assumptions of multiple hierarchical regression is a correlation between predictor and outcome variables, Pearson's correlations were computed as preliminary analyses to find out potential predictors for liking judgements for dance scenes. Mean liking judgements and the rest of mean aesthetic judgement scores (i.e., seven semantic differential scale scores including exciting, varied, controlled, etc.) were computed from all the synchronous and asynchronous dance videos.

As shown in Table 6.1, the mean liking judgement score significantly correlated with mean judgement of happiness, familiarity, variety, diversity and arousal in the British sample. In the Japanese sample, the mean liking judgement score significantly correlated with mean judgement scores of obviousness and happiness. Thus, these significantly correlated variables were entered as potential predictors of dance preference (i.e., mean liking judgement score) in the following hierarchical regressions.

Table 6.1. Pearson's Correlations for Mean Liking Judgement and Mean Aesthetic Judgements in Participants from UK and Japan.

	Mean Liking Judgement (UK [a])	Mean Liking Judgement (Japan [b])
Variety	.55**	.27
Familiarity	.56**	.09
Happiness	.78**	.49**
Control	-.04	.08
Obviousness	.08	.48**
Arousal	.33*	.22
Diversity	.39*	.11

Note. Pearson's correlations for participants from UK and Japan.

[a] n = 40. [b] n = 50.

**p < .05, **p < .001, two-tailed.*

6.3.7 Predictors of Liking in British Sample

In order to test whether one variable is a significant predictor of an outcome, multiple hierarchical regression tests such relationship while statistically controlling the effects of potential intervenient variables in such relation. For this reason, multiple hierarchical regression was applied to analyse data from the British sample. A hierarchical multiple regression tested which semantic differentiations of dance scenes would better predict participants' dance performance for British participants. In step 1, gender, age, dance exposure (experience in watching dance performances), and dance experience (experience in dance training) were entered as the variables gender, age, dance exposure, and dance experience were entered as control variables. All the semantic differentiation predictors identified by the significant Pearson's correlations (i.e., happiness, familiarity, variety, and arousal) were added in step 2. As shown in Table 6.2, happiness and variety were significant predictors of mean liking judgements in British participants.

Table 6.2. Hierarchical multiple regression with British sample.

	B	**SE B**	**β**	**R^2**	**R^2 Change**
Step 1				.07	.07
Gender	-.18	.34	-.09		
Age	-.00	.01	-.05		
Frequent visitor	.50	.35	.26		
Training	-.10	.36	-.05		
Step 2				.72	.65
Happiness	1.40	.26	.84**		
Familiarity	-.02	.14	-.02		
Variety	.46	.21	.44*		
Diversity	-.40	.22	-.39		
Arousal	.13	.21	.08		

Note: R^2 = .07 for Step 1, ΔR^2 = .65 (p < .001). *p < .05. **p < .001.

6.3.8 Predictors of Liking in Japanese Sample

As mentioned before, in order to test whether one variable is a significant predictor of an outcome, multiple hierarchical regression tests such relationship while statistically controlling the effects of potential intervenient variables in such relation. For this reason, multiple hierarchical regression was applied to analyse data from the Japanese sample. In a similar manner, a hierarchical multiple regression was conducted for the Japanese sample to test whether general aesthetic judgements of happiness and obviousness were significant predictors of their mean liking judgements. Five outliers were excluded during hierarchical multiple regression analysis when checking for assumptions. In step 1, the variables gender and age were entered as control variables. The variables exposure (if participants were frequent visitors of dance performances) and experience (if participants had received any professional dance training) were not included in the analysis because none of the Japanese participants was a frequent visitor of dance performances and none of the Japanese participants had received any professional dance training. In step 2, the predictor variables (general aesthetic judgements of happiness and obviousness) were entered. As shown in Table 6.3, gender, happiness, and obviousness were found to be significant predictors of mean liking judgements in Japanese participants.

Since gender was a significant predictor, a t-test was conducted to explore the direction of such relationship. A further independent t-test showed that general preference was higher in Japanese male (M = .92, SD = .45) than in Japanese female participants (M = .54, SD = .59), $t(47) = 2.41$, $p < .05$, $r = .33$. These results indicate a tendency of male Japanese participants to score higher than female Japanese participants in general aesthetic preference.

Table 6.3. Hierarchical multiple regression with Japanese sample.

	B	**SE B**	**β**	**R^2**	**R^2 Change**
Step 1				.14	.14
Gender	.43	.17	.38*		
Age	-.01	.08	-.02		
Step 2				.44	.30
Happiness	.43	.18	.31*		
Obviousness	.40	.16	.35*		

Note: R^2 = .14 for Step 1, ΔR^2 = .30 (p < .001). *p < .05.

6.4 Discussion

Western and East Asian cultures show marked differences in aesthetic appreciation of the visual arts. East Asian aesthetics are often associated with a holistic focus on balance and harmony, in contrast to Western aesthetics, which often focus on the expression of the individual. In this study, we examined whether similar cultural differences also exist in the performing arts: the aesthetics of movement synchrony in dance. Japanese and British participants completed an online survey in which they evaluated synchronous and asynchronous dance video clips on eight semantic differential scales. To link aesthetic appreciation to cultural values and beliefs, we further assessed collectivism/individualism and need for uniqueness. In line with a Western focus on individual rather than group movements, British participants preferred asynchronous dance movements, whereas Japanese participants preferred groups moving in synchrony, supporting hypothesis 1. British preferences were predicted by perceived movement happiness and variety. In contrast, Japanese preferences were predicted by perceived happiness and obviousness, partially supporting hypothesis 3. Despite culturally specific aesthetic preferences and associations that supported hypothesis 1 and 2, the cultural difference in the preferences for synchrony were not mediated by individualism/collectivism, sensation seeking or need for uniqueness/conformity scores, which did not support hypothesis 4. Our findings suggest that cultural differences in aesthetic perception extend to the performing arts, and specifically group dancing, yet do not map easily onto explicitly held cultural values on the role of the individual in society.

In contrast to our predictions, these cultural differences in aesthetic perception were not mediated by corresponding difference in collectivism/individualism, need for uniqueness/conformity, or sensation seeking scores. Arguably, both individualism and collectivism scales presented low reliability in Japanese participants, as shown in their Cronbach’s alphas. This might explain why we did not find significant cultural differences in individualism and collectivism. Alternatively, aesthetic judgements may be more sensitive to these cultural differences, as they are presumably more intuitive and less likely to be biased by social desirability than self-reported measures.

Studies 3, 4, and 5 identify group synchrony as a strong aesthetic feature of aesthetic appreciation of the performing arts. Synchronous movement does not only

produce prosocial behaviour in performers (Wiltermuth & Heath, 2009), but communicates group cohesion to spectators of the performance (Hagen & Bryant, 2003; Lakens & Stel, 2011). In study 5, both cultures showed clear preferences in relation to how a group of performers coordinated their movements with each other. The direction of this influence was strongly dependent on cultural background and different semantic association triggered by the observation of movement synchronisation. These cultural differences however were not mediated by explicitly held social norms of collectivism or individualism. Our findings support aesthetic theories that emphasise context-specificity and individual differences as a key factor of aesthetic appreciation (Bullot & Reber, 2013; Leder & Nadal, 2014).

Asynchronous dance was less obvious for British and Japanese participants. However, the synchronous dance was more obvious for the Japanese participants but not for the British respondents. This means that British and Japanese participants perceive obviousness in different ways. On one hand, aesthetic judgement of obviousness is relevant for Japanese participants and obviousness is a significant predictor of general aesthetic preference in that group, as supported by the hierarchical multiple regression. For Japanese participants, synchronous dance is obvious and asynchronous dance is subtle. On the other hand, for British participants both synchronous and asynchronous dance are obvious. This result supports the notion of two different ways of appreciating dance. According to the cultural model, and in line with holistic and analytic perceptual styles (Masuda et al., 2008), British participants appreciate dance movements in a more analytical way and Japanese participants appreciate dance movements from a more holistic approach. We can propose the analytical perceptual style of British participants would focus more on individual body movements, meaning that both synchronous and asynchronous dances are obvious because British observers are not comparing each dancer's body movement against the other. Presumably, the holistic approach of Japanese participants would focus more on dance moves performed as a group, meaning that the asynchronous dance is subtle because it is not clear if there are dance moves performed as a whole. For the holistic approach of Japanese participants, the synchronous dance is obvious because each dancer enhances the dance move the group is performing. For the holistic approach, each part of the whole enhances the impact of the dance. For the analytical approach, each

individual part conveys a clear message by itself, no matter if it is in synchrony or asynchrony with the others.

Japanese participants perceived asynchronous group movement as more accidental and less obvious when compared to British participants' ratings. Interestingly, we found that British participants did not associate asynchrony with a lack of control as much as Japanese participants did. Furthermore, the semantic differential predictors of dance preferences also found some cultural differences; perceived variety of movements significantly correlated with British aesthetic preference, whereas obviousness of the movement, with Japanese aesthetic preference.

Perceived happiness of the movement emerged as the only culturally shared predictor of aesthetic preferences, both cultures preferred happy over sad moves. These findings contrast with previous philosophical accounts that conceptualise the characterisation of sad emotions in Japanese aesthetics (Keene, as cited in Odin, 2016; Odin, 2016). However, such differences could be due to the distinct nature of the philosophical analysis, which has been based on traditional visual arts and design, and, in contrast, here we have an empirical study analysing a contemporary sample that is appreciating dance movements.

Finally, our study suggests that aesthetic judgements are a sensitive measure of cultural differences, whilst avoiding biases that are often associated with measures based on self-report. For instance, previous studies have found that, when using self-reported scales, participants from collectivistic cultures tend to score higher in individualism because they compare themselves to other more collectivistic peers in their same culture (Heine, Lehman, Peng, & Greenholtz, 2002). Aesthetic judgements avoid this potential confound, since they do not require comparisons of self against others, but indirectly assess the influence of cultural values on pleasure derived from aesthetic objects, in our case dance videos.

The present experiment supports the notion of holistic and analytical perception regarding aesthetic appreciation of dance across cultures. Our findings show preferred aesthetic features and aesthetic associations vary according to the cultural background of the observer. The next chapter will present a general

discussion of the five experiments, highlighting their contributions and connections with relevant literature.

CHAPTER 7

GENERAL DISCUSSION

7.1 Introduction

The aims of the present thesis were twofold: methodological and conceptual. Methodologically, in the first two experiments, for the first time we successfully applied the method of production to study aesthetic preference for human movement. These two studies found that novices prefer smooth and symmetrical movements. Conceptually, in studies 3 and 4, we applied the method of choice to study aesthetic effects of the interaction between movement feasibility, imagery, and synchrony. In line with the first two studies that applied the method of production, studies 3 and 4 found that novices prefer to watch feasible movements, in this case, smooth movements performed in synchrony. Also, a conceptual aim, the influence of culture on aesthetic perception of synchronous movement was studied in the fifth study. This cross-cultural study found that British participants prefer asynchrony, while Japanese participants prefer synchrony.

The next sections will discuss the contributions from the five studies, how these results support our theoretical predictions from the neurocognitive model and from the cultural model, their limitations and implications for future research, followed by concluding remarks.

7.2 The Method of Production Applied to Empirical Aesthetics of Human Movement

The sequence production experiment (study 1) and the production of animations task (study 2) showed that the method of production can be applied to study empirical aesthetics of human movement. These experiments successfully addressed two research questions (can the method of production be applied to empirical aesthetics of human movement? What is the role of movement feasibility in aesthetic perception?) and the methodological research aim (to apply the method of

production to study aesthetic perception of human movement). It was the first time the method of production was applied to study aesthetic preference for human movement and it was the first time that feasible movements were compared against unfeasible movements to study aesthetic preference.

As mentioned in the general introduction, human movement has adapted to motion under physical constraints. Such adaptations have been explained in mathematical terms, as the two-thirds power law (Catavitello et al., 2016;Viviani & Schneider, 1991) and the minimum-jerk model hypothesis (Flash & Hogan, 1985; Viviani & Flash, 1995). The latter has proposed that smooth movements optimise energy use to execute motion under physical constraints. Congruently, human visual system has adapted to prioritise the identification of biological motion over non-biological motion (Grossman & Blake, 2002; Hiris, 2007; Neri et al., 1998; Poom & Olsson, 2002; Pyles et al., 2007; Simion et al., 2008). Since the neurocognitive model of aesthetic appreciation in the performing arts predicts that novices will prefer stimuli that is easier to process while adopting a low cognitive effort strategy, and considering that smooth movements are biological and easier to process visually, we propose that smooth motion is aesthetically pleasant for novices adopting a low cognitive effort strategy of aesthetic appreciation. The conceptual framework of the neurocognitive model of aesthetic appreciation in the performing arts (Orgs et al., 2016) was supported by the first two experiments that applied the method of production because we found that fluency predicted aesthetic preference for smooth and symmetrical movements.

In the first two experiments, the favourite sequences were the most familiar: images of the human body were preferred to abstract images. Novices preferred familiar images performing familiar/feasible movements. This is in line with previous studies that have found preferences for movements that are familiar and easier to perform (Kirsch et al., 2015; Kirsch et al., 2013). Also, it is in line with studies that found preference for familiar moving displays (Topolinski, 2010) and familiar ABM sequences (Orgs et al., 2013). Our results support the neurocognitive model of aesthetic appreciation in the performing arts (Orgs et al., 2016), since we found that novices adopted a low cognitive effort strategy of aesthetic appreciation. For instance, in the open questions of the sequence production experiment, participants did not express a difference between judgement of liking and interestingness. For

them, judgements of positive valence (liking) and judgements of aesthetic arousal (interestingness) were the same.

Studies 1 and 2 showed that participants use symmetry and movement continuation as compositional rules. The sequence production experiment explains what happens when the sorting criteria implies the presence or absence of movement. It is possible to explain preference based on criteria or to determine the influence of criteria on preference. Despite the sequence production experiment did not mention aesthetic features associated with movement or sequential arrangement, participants produced consistent compositional rules. Later, when producing actual animations, the second experiment confirmed aesthetic patterns congruent with those found in the first study. In a broader sense, when perceiving events, people actively segment them into simpler sequences by abstracting meaningful information, based on event's physical features and observer's previous experience or expectations (Zacks, Speer, Swallow, & Maley, 2010; Zacks & Tversky, 2001). In this way, continuous, complex and chaotic inputs are processed and transformed into manageable streams of predictable information (Zacks, et al., 2010; Zacks & Tversky, 2001). In a similar manner, in studies 1 and 2, participants generated sequences to make sense of the visual stimuli that we asked them to sort. These findings altogether go in line with previous studies that have applied the method of production in visual arts (McManus et al., 2010; Westphal-Fitch et al., 2013): humans are continually applying patterns to make sense of the world, without even noticing it.

7.2.1 Comparing the Method of Production and the Method of Choice

Regarding the second research question (will the method of production and the method of choice yield different results?) it can be said that studies 1 and 2 (method of production) and studies 3 and 4 (method of choice) were consistent. In the four experiments, novices preferred smooth movements to abrupt movements, supporting the hypothesis that fluency will predict aesthetic preference when comparing feasible against unfeasible movements, which was a theoretical prediction from the neurocognitive model of aesthetic appreciation in the performing arts (Orgs et al., 2016). In the method of production, participants produced higher continuation and symmetry (higher feasibility and fluency) for judgement of liking,

and produced lower continuation and symmetry (lower feasibility and fluency) for judgement of disliking. In the method of choice, participants liked smooth movements performed in synchrony (higher feasibility) and disliked abrupt movements performed in asynchrony (lower feasibility).

Studies 1, 2, and 4 shared unexpected findings: numerical scores showed a general lack of significant differences between biological and non-biological motion, except for judgement of arousal in study 4. These specific findings will be discussed later in the section “aesthetic effect of movement feasibility when perceived in combination with imagery and synchrony”.

Overall, findings from the method of production and method of choice show that production and preference is not exclusive to conventions in the creation of aesthetic patterns, but it is also present in the method of choice, confirming that novices prefer producing and watching feasible smooth movements, and that they are appreciating fluency. This comparison of methods is congruent with a previous cross-cultural study about aesthetic perception of visual arts in Eastern and Western participants (Masuda et al., 2008). That cross-cultural study (Masuda et al., 2008) did not mention the application of the method of production nor the method of choice, possibly, because the researchers had a background in cross-cultural psychology but not in psychology of aesthetics, however, they effectively applied those complementary methods, just without naming their formal labels as used in psychology of aesthetics.

The congruency between our results from the method of production and from the method of choice can be related to the mirror model of art as well (Tinio, 2013), since we found aesthetic production and aesthetic perception share the preference for the generation and appreciation of smooth movements. While in the method of production sequence generation started with an aesthetic judgement we indicated to participants (e.g. movements participants would like to see) and finished with the production of smooth movements by participants, in the method of choice aesthetic perception started with the observation of smooth movements we presented to participants and finished with participants making aesthetic judgements about the movements (e.g. liking judgements for smooth movements).

7.2.2 The Role of Movement Feasibility in Aesthetic Perception

By comparing the method of production and the method of choice, we can also address the third research question (what is the role of movement feasibility in aesthetic perception?). Considering the first four studies, we can say that movement feasibility is a strong determinant of aesthetic preference. In studies 1, 2, 3, and 4, feasible movements were preferred to unfeasible sequences, supporting our theoretical predictions. The first four studies support the neurocognitive model of aesthetic appreciation in the performing arts (Orgs et al., 2016), because they show that novices prefer feasible movements by adopting a low cognitive effort strategy of aesthetic appreciation, basing aesthetic judgements on positive valence and appreciating fluency's positive hedonic mark. In other words, novice's low cognitive effort appreciation was driven by fluency.

In studies 1 and 2, novices preferred smooth human movements to abrupt movements. Also, in studies 3 and 4, non-experts preferred smooth human movements performed in synchrony to abrupt movements performed in asynchrony. This pattern was constant in individual sequences (studies 1 and 2), in group sequences (studies 3 and 4), and it also applied for moving body images in studies 2 and 4, meaning that human movement feasibility predicts novice' aesthetic preference across different conditions such as, method of production, method of choice, and sequences with one and two dancers.

Since feasible motion is possible to perform in everyday life, these human movements are more familiar than unfeasible ones. Also, smooth trajectories are easier to predict and easier to visually process in comparison to abrupt movements. This was consistent with participants' judgements because they found feasible movements as more obvious and familiar than unfeasible sequences. This means that participants preferred familiar and obvious human movements, that are possible and easier to perform, easier to process, which can be interpreted as novices' aesthetic preference driven by fluency, supporting our theoretical predictions.

7.3 Aesthetic Effect of Movement Feasibility when Perceived in Combination with Imagery and Synchrony

The fourth research question (what is the aesthetic effect of movement feasibility when perceived in combination with other aesthetic features such as imagery and synchrony?) can be addressed from studies 3 and 4. Study 3 tested the interaction between movement smoothness and synchrony in human body video animations, while study 4 explored the interaction between movement aesthetic features (smoothness/synchrony) and imagery (abstract/body video animations). In both studies, we found that feasibility and synchrony significantly increase aesthetic preference, while unfeasibility and asynchrony significantly decrease liking. Moreover, intermediate combinations cause intermediate effects. For instance, in study 3 we did not find a significant difference between smooth movements performed in asynchrony and abrupt movements performed in synchrony. As expected, the more extreme combinations, such as smooth synchrony and abrupt asynchrony, were the most liked and disliked sequences, respectively. However, less extreme combinations, such as smooth asynchrony and abrupt synchrony were perceived in the middle of the preference continuum. This surprising finding that synchrony effect is not subordinated to smoothness seems to support the model of hierarchical representation of dance movement (Orgs et al., 2013) and the generative theory of tonal music (Lerdahl & Jackendorff, 1983), as those theoretical frameworks propose that aesthetic effects from different hierarchical levels should be independent from each other. In the case of our experiment, smoothness is at the dynamic level, in the movement or transition between one frame and the next one, while synchrony is at the structural level, across the choreographic phrase. Our findings suggest that, when appreciating human movement, novices are not only considering basic hierarchical levels (dynamic level), as hypothesised by Orgs et al. (2013), but also on a superior level such as the structural.

These results support our predictions, but some of them were unexpected, because we hypothesised a more clear-cut pattern. We expected smooth synchrony and smooth asynchrony as significantly more liked than abrupt synchrony and abrupt asynchrony. We underestimated the aesthetic effects of synchrony in combination with movement continuation. We expected a significant difference between smooth asynchrony and abrupt synchrony, however, we found that synchrony increased

liking scores of abrupt movements and asynchrony decreased liking scores of smooth movements, closing the gap between smooth and abrupt movements.

As mentioned before, when comparing the method of production and the method of choice, in study 4, the only significant interaction between movement and imagery was found in aesthetic judgement of arousal. In study 1, we found differences in the production of abstract and body sequences. In study 2, we did not find differences in the production of abstract and body animations. In study 4, there were no differences between most aesthetic judgements for abstract and body video animations. The only exception was judgement of arousal, which presented a significant interaction, where body video animations were more powerful than abstract animations when communicating calmness and excitement through movement.

These comparisons between biological and non-biological motion could support the embodied cognition framework (Glenberg & Kaschak, 2002; Glenberg et al., 2008; Wilson, 2002). It could be possible to argue that when participants relate the observed images to their own body, abstract and body sequences are meaningful and participants can apply compositional rules to produce movement patterns in the method of production, or can emit similar aesthetic judgements when watching abstract and body video animations in the method of choice. This was most evident in the transition from study 1 to study 2, and later it was confirmed in study 4. When we presented static images with random orientation, as in study 1, there were differences in the compositions of abstract and body sequences. However, when we presented apparent motion with constant orientation of the images, as in studies 2 and 4, there were no differences in the compositions/judgements of abstract and body sequences. However, the scope of this interpretation will be addressed later in the section of limitations and future research.

7.4 The Role of Culture in Aesthetic Perception of Human Movement

The fifth research question (what is the role of culture in aesthetic perception of human movement?) was approached in the fifth study by examining cultural differences between Eastern and Western cultures in aesthetic perception of dance movement. In line with our hypothesis, British participants preferred asynchronous dancing while Japanese participants preferred synchronous dancing. In this way, the

fifth study supports the new theoretical model we proposed to study cultural differences in aesthetic perception of synchronous movement, since we found cultural differences when participants watched different aesthetic features that were similar in terms of movement feasibility. This is, Eastern and Western participants perceived synchrony and asynchrony in different ways.

Our findings are consistent with a holistic attentional focus in Japanese participants (Masuda & Nisbett, 2001; Miyamoto et al., 2006), who overall favoured unison group movement over asynchronous individual movements. In contrast, British participants favoured individual asynchronous movement over unison group movement, which is consistent with an analytic attentional style and a preference for salient specific features in other visual displays (Masuda & Nisbett, 2001; Miyamoto et al., 2006).

We propose that aesthetic perception of dance may therefore provide an implicit window into socio-cultural values. In line with previous cross-cultural comparisons between Eastern and Western societies (Kim & Markus, 1999; Masuda et al., 2008), study 5 shows culture-specific aesthetic preferences. These cultural differences were also apparent in semantic differential perceptions for synchronous and asynchronous movements.

Our findings are therefore consistent with the notion that Eastern societies favour holistic modes of aesthetic appreciation and that Western societies emphasise analytic appreciation of specific objects or in our case – people (Masuda & Nisbett, 2001; Miyamoto et al., 2006). In synchronous movement, a visual gestalt emerges from the collective movement of individuals, representing the group as a whole (Arnheim, 1974). In contrast, asynchronous collective movement emphasises specific movements of individual people, but does not produce a visual gestalt of group movement.

Conceivably aesthetic preferences for specific video clips may also depend on other factors than group synchrony, most notably familiarity with the movements on display or specific preferences for the performers themselves. However, preferences in study 5 were not influenced by ethnicity of the performers or familiarity with the videos, emphasising the importance of movement synchrony among other visual features of the video.

In sum, study 5 shows that aesthetic perception of synchrony is influenced by cultural differences, reflecting a more global attentional focus in Japanese participants, previously reported for the aesthetic perception of static visual scenes, drawings and photographs.

7.4.1 Aesthetic Perception of Human Movement across the Method of Choice

Despite study 3 answered research questions different to those explored in study 5, we can relate some of their findings, since we applied the same semantic differential scales in those experiments, and most of the participants in study 3 were British or nationals from Western countries. On one hand, in study 3, perception of obviousness was congruent with judgement of obviousness in British participants from study 5. These were counterintuitive results regarding judgement of obviousness, considering that those participants found synchronous and asynchronous movements as similarly obvious. On the other hand, judgement of happiness was a significant predictor of aesthetic preference for human movement in studies 3 and 5. As mentioned before, this was shared by British and Japanese participants in study 5, as well as participants from study 3.

These results together point towards a consistent pattern in aesthetic perception of human movement, which can be interpreted cautiously as novices from different cultures adopting low cognitive effort strategies to appreciate human movement. In this case, “low cognitive effort” means such strategies are passive compared to the strategies adopted by experts. However, novices are judging and appreciating actively, based on affective and perceptual features.

We can relate the neurocognitive model of aesthetic appreciation with the proposed cultural model. The models are compatible since we can extend the concept of strategy of aesthetic appreciation (Orgs et al., 2016) to the proposed model of cross-cultural aesthetics of dance appreciation. We can infer that novices from different cultures have different perceptual styles of aesthetic appreciation, which are mediated by cultural values. Also, we can say that novices from different cultural groups share the adoption of a low cognitive effort strategy of aesthetic appreciation, and that their aesthetic judgements are not guided by explicit aesthetic concepts. Preference is mediated by cultural factors, not fluency alone, when

watching different aesthetic features (synchrony/asynchrony) that are similar in terms of movement feasibility.

If British and Japanese participants adopted a low cognitive effort strategy, each sample preferred the dance type that is easier to process for them. If this is the case, it implies that some aesthetic objects are more compatible with some perceptual styles. If the perceptual style is compatible with the aesthetic object, processing should be easier, fluency should be higher. Since asynchronous dance focuses on the parts, it should be compatible with the analytical perceptual style, whereas synchronous dance should be compatible with the holistic style, focusing on the group as a whole. Then, presumably, asynchronous dance should be easier to process (high fluency) if perceived analytically, whereas synchronous dance should be easier to process if perceived holistically.

In this proposed convergence between the neurocognitive model and the cultural model, cultural background (Eastern, Western), perceptual style (holistic, analytic), strategy of aesthetic appreciation (high or low cognitive effort), and level of expertise (expert, novice), are different layers of aesthetic appreciation. Typically, novices' appreciation depends on salient visual features rather than on aesthetic concepts, therefore novices should not be able to choose between strategies of aesthetic appreciation, but experts could choose between strategies and could challenge their own cultural values. For instance, a novice with Eastern cultural background will tend to perceive aesthetic objects holistically and will typically adopt a low cognitive effort strategy of aesthetic appreciation, resulting in preference for synchronous dance. A novice with Western cultural background will tend to perceive objects analytically, adopting a low cognitive effort strategy, resulting in preference for asynchronous dance. Experts will tend to perceive objects holistically or analytically depending on their cultural background, but should be able to choose between adopting a high or low cognitive effort strategy, meaning that they could switch between preferring what is easier (high fluency) or what is more difficult to process (low fluency). Moreover, switching between perceptual styles might be a potential consequence of such cognitive flexibility in experts. Since we did not manipulate cognitive effort, future studies could test this conceptual formulation by testing experts under different conditions that could facilitate high or low cognitive

effort. For instance, Reber et al. (2004), have proposed that under time pressure, aesthetic perception should depend on salient perceptual features.

7.5 Limitations and Future Research

One of the methodological implications for psychology research is that this is the first time the method of production was used to study aesthetic preference for static and moving image sequences. An adaptation of the card sorting technique (in studies 1 and 2, with printed images and digital images, respectively) shows its suitability for measuring aesthetic features such as global symmetry, local symmetry and movement continuation. One advantage of the card sorting technique and production of animations task is the low-cost materials and simple application. Also, there is no need of expensive and complex technical equipment. Such simplicity facilitates a faster training for experimenters. Since participants do not need high language proficiency and the methodology has shown to be very ludic, this technique has the potential to be applied to a wider population such as children and older adults, clinical patients and illiterate or less technologically versed participants. All these advantages make it suitable for replication across different cultures and socioeconomic contexts such as developed and developing nations as well.

On the other hand, one of the disadvantages of this adaptation of card sorting technique and production of animations task is the time-consuming measurement compared to computer based or online experiments that apply the method of choice which automatically collect and store the scores. Also, in our applications of the method of production, there is the need to verify for errors in the scoring and it needs to be applied individually.

Regarding the comparisons between biological and non-biological sequences, it is also interesting that participants preferred smooth motion in abstract and human body sequences. It is possible that the absence of body specific effects was due to the long exposure to the visual stimuli in our experiments: up to five minutes in the generation of sequences, and six seconds to watch each video animation in study 4 (aesthetic perception of abstract and human body video animations). This means that possibly participants had more time to adequately process the visual information and engage with the stimuli. Previous studies that have found differences in the

perception of biological and non-biological motion have used very short exposure times, for instance, 1 second (Grossman & Blake, 2002), 1.2 seconds (Poom & Olsson, 2002), 1.4 seconds (Hiris, 2007), 1.5 and 1.8 seconds (Pyles et al., 2007), 600 milliseconds and 2.8 seconds (Neri et al., 1998).

Another of the reasons for lack of differences between abstract and body animations could be found in the instructions in study 4 because participants were asked to focus on movement itself rather than on the clothes or background. This could mean that participants tried to focus in judging the characteristics of the movement itself while ignoring what/who was performing it. Future studies should compare if different instructions could influence judgements in different ways. Nevertheless, despite the instructions, the effect of imagery on judgement of arousal was significant. This shows that for some aesthetic dimensions, the effect of human body movement goes beyond the type of instruction given in this experiment. The same could happen with our method of production experiments, because instructions emphasised movement rather than imagery. There, possibly participants tried to ignore the relation between movement and the images that are performing the movements. Future research could instruct participants to consider the best matching movements for specific images. Here we focused on instructions that emphasised movement to test whether the effect of imagery could go beyond the restrictions suggested by the instructions. Also, having limited resources (time, funding, number of researchers) it was not viable to run more experiments varying the type of instructions. Considering this, we decided to keep them constant, to go from a general design in the first experiments to more specific designs in future studies.

Alternatively, one could say that, in line with the domain-general motor contributions to perception hypothesis (Press & Cook, 2015), abstract sequences were perceived as animated when they were presented together with body sequences. Nevertheless, this is not the case, because, in the method of production experiments, abstract sequences were generated before body sequences. In study 4, to control this potential effect, presentation was counterbalanced: one group saw abstract video animations first, and then observed body animations. The other group watched body animations first, and then viewed abstract animations.

All these findings suggest a pattern towards the effectiveness of this kind of instructions to study aesthetic judgement of human movement: it seems that if we ask participants to focus on movement itself, they are going to do so, ignoring other aspects such as clothes, background, dancers' ethnicity, etc., which points that it was an appropriate instruction for the cross-cultural experiment as well. Also, this was corroborated in the mixed ANOVA for mean liking judgement that controlled for dancer's appearance in the cross-cultural study.

It is worth noting that studies 3 and 4 were not cross-cultural experiments and their participants' inclusion criteria were different to the criteria of study 5. Comparisons among these studies should be interpreted with caution due to such differences in inclusion criteria. Further research could explore cross-cultural differences in the method of production by applying the card sorting technique/production of digital animations, and test cross-cultural differences in the method of choice by presenting video animations as in studies 3 and 4. Also, future studies on synchrony perception should further explore the extent to which such preferences relate to personality traits and other measures of cultural identity. Since study 5 was online, further research could attempt to replicate it in laboratory settings with cross-cultural sample.

Another limitation is related to the visual stimuli used in the first four experiments. Since the notions of feasibility, familiarity and fluency are closely related, it is not always possible to distinguish between their effects. For example, smooth human motion is feasible, familiar and fluent (in the sense of processing fluency theory). In turn, abstract sequences may be smooth or abrupt, but are not properly feasible to perform in everyday life because they are not executed by a conventional agent (Marin, Issartel, & Chaminade, 2009), this is, an intentional subject performing an action, however, synchronous smooth abstract sequences are higher in fluency than asynchronous and abrupt sequences. Past research has partially addressed these issues by manipulating familiarity (e.g. Orgs et al., 2013), however, to increase ecological validity, the present research aimed at measuring spontaneous novices' judgements, without inducing any of the above conditions through the implementation of training nor learning mechanisms. Future research could measure training/learning effects on aesthetic perception for the different conditions assessed in the present studies.

Finally, our basic research on aesthetic perception of human movement has more implications for applied research, considering that smooth movements are also more predictable. From an applied perspective, it is possible to say that perception and anticipation of movements is an essential ability in everyday life in order to perform an action or to understand the behaviours of other people (Cook, Blakemore & Press, 2013; Cook, Saygin, Swain, & Blakemore, 2009; Freitag et al., 2008). This has operative and social implications that help us to interact with the environment and with other persons (Cook et al., 2013). While experts in performing arts may be more accurate to judge a movement in comparison to novice observers, people with autism present more difficulties to perceive and predict human movement at a basic level (Cook et al., 2009, 2013; Freitag et al., 2008). Understanding the behavioural differences among experts and novices as a first instance, and then among people with autism, may help to develop educational interventions to enhance the learning in domains such as performing arts or sports and clinical interventions to enhance movement perception in people with autism. Also, the knowledge developed in aesthetic preference of human movement might be applied in marketing and computer animation as well, identifying the preference for observing determine postures and movements, which may lead to the development of visual stimuli that can be more attractive for the consumer.

7.6 Conclusion

The present thesis makes contributions to the field of psychology of aesthetics, in special, to fundamental research on empirical aesthetics of human movement. Methodologically, this is the first time the method of production is applied to study aesthetic preference for human movement. Moreover, the method of choice was applied too, to compare its results with those from the method of production.

Conceptually, it was the first time feasible/familiar movements were compared against unfeasible/unfamiliar movements. Here, it was found that novices prefer feasible/familiar movements, and that such preference is driven by appreciation of fluency, revealing that movement smoothness is a significant predictor of aesthetic preference, in line with our predictions from the neurocognitive model of aesthetic appreciation in the performing arts (Orgs et al., 2016), and previous studies on preference for familiar and fluent movements (Kirsch et al., 2015; Kirsch et al., 2013; Orgs et al., 2013; Topolinksi, 2010).

Another contribution is related to the study of aesthetic perception of movement synchrony and cross-cultural psychology. We found that British observers prefer asynchronous movement, whereas Japanese spectators prefer synchronous movement, supporting our proposed cultural model and previous cultural studies in visual domains that have found analytic attentional styles in Western samples and holistic attentional focus in Eastern groups (Masuda & Nisbett, 2001; Miyamoto et al., 2006). Interestingly, we found that, for novices, human body animations were more expressive than abstract animations regarding aesthetic judgement of arousal, emphasising the unique potency of human body movement in non-verbal communication. Overall, our five experiments show that aesthetic judgement of happiness is a significant predictor of aesthetic preference for human movement, linking novices' aesthetic perception with aesthetic judgement of positive valence as proposed by Orgs et al. (2016).

As mentioned in the previous section, the present research has implications beyond psychology of aesthetics, with potential for applied research in clinical and educational settings, as well as in marketing, arts and entertainment. To extend the scope of the current findings, future studies should address replications varying the different task instructions and populations. The present research opens the doors to new lines of research in perception of human movement and performing arts: the method of production, motion smoothness, synchrony, and cross-cultural aesthetics.

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APPENDICES

Appendix 1.

Ethics approval valid until 05/July/2015, extended until 05/July/2016 through electronic correspondence with Dr Achim Schuetzwohl.

Student: Ernesto Monroy

Brunel UNIVERSITY LONDON

Applicant (Principal Investigator) Name: Ernesto Monroy
Applicant's e-signature: Ernesto Monroy
Date: 21/07/2014

Supervisor or module leader (where appropriate): Dr Guido Orgs
 E-signature:
Date: 21/07/2014

Departmental Ethics Coordinator section:

This request for expedited review has been:	☒ Approved (No additional ethics form is necessary)
	☐ Declined (Full University Ethics Form is necessary)
	☐ Declined (Please give reason below)

Departmental Ethics Coordinator Name: Bridget Dibb
E- signature Bridget Dibb
Date: 20/08/14

Appendix 2.

Instructions for creating the sequences in study 1.

Instructions for card sorting

You will sort the cards in sets of images that you would **like** to see and in sets of images that you would **consider interesting** to see according to the instructions given by the researcher. There is no right or wrong answer: it depends on your subjective criteria.

The procedure will be repeated with different sets of images. You will have up to 5 minutes per sorting but it may take less time. After sorting each group, please inform the researcher about it in order to register the results and continue with the next set of cards.

Please take into account the following parameters:

1. You will see a set of 12 cards.
2. You will choose 7 cards.
3. Sort the selected images in a set of 7 cards. Each set must contain 7 cards.
4. The set of the selected cards must be arranged horizontally, from left to right.

If you have any question, please ask the researcher. If you are ready to start please inform the researcher.

Appendix 3.

Instructions for creating the animations in study 2.

Instructions for producing .gif files

You will sort images into moving sequences that you would **like** to see and into moving sequences that you would **dislike** to see according to the instructions given by the researcher. There is no right or wrong answer: it depends on your subjective criteria. You are going to produce animations for different sets of images. You will create these animations using a simple software to create .gif files. GIF's are digital animations consisting of sequences of photos.

The procedure will be repeated with different sets of images. You will have up to 5 minutes to create each animation but it may take less time. When you have completed one specific animation, please inform the researcher about it in order to register the results and continue with the next set of images.

For each animation please follow the steps below:

1. First you will see a set of 12 images.
2. Out of these 12 images, please choose 7 images.
3. Sort the selected images in a set of 7 pictures. Each set must contain 7 images.
4. The set of the selected images must be arranged horizontally, from left to right.
5. As you drop the photos in the centre of the software, you will see the moving sequences. If you want, you can change the order of the images. Those changes will be applied to the moving sequence in the moment.
6. You can substitute your selection of 7 images at all times and keep rearranging for up to five minutes.

If you have any question, please ask the researcher. If you are ready to start please inform the researcher.

Appendix 4.

Snapshots and links of synchronous and asynchronous videos used in study 5.

Synchronous videos	
Snapshot	**Link**
	https://youtu.be/BRaY4sipglI
	https://youtu.be/pS36UIuBm4o
	https://youtu.be/bFNFLAzXun8
	https://youtu.be/OPShMnx0cIA
	https://youtu.be/jFOeJS4IgFI

Synchronous videos (cont.)	
Snapshot	**Link**
	https://youtu.be/n6VSb6_rndU
	https://youtu.be/wHiw87vfa4A
	https://youtu.be/1WDzSPz6bdA
	https://youtu.be/aACuIUqePq8
	https://youtu.be/AGRAhs0wg-E

Asynchronous videos	
Snapshot	**Link**
	https://youtu.be/NJKlZaxY5PM
	https://youtu.be/hcxcxHwrwCU
	https://youtu.be/E5jZzIUIPtQ
	https://youtu.be/gpbiaiVqEog
	https://youtu.be/FxV1rYADm6g

Asynchronous videos (cont.)	
Snapshot	**Link**
	https://youtu.be/Ys32YhHoeTE
	https://youtu.be/wVckGWSoPG0
	https://youtu.be/jLhHFBfQxyo
	https://youtu.be/myAJccRP-g4
	https://youtu.be/jwtsnJby7zc