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Threat biases associate with anxiety and depression in physically-abused young people with a history of child labour

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Highlights

- Abuse status associated with meeting the symptom threshold for major depression
- Abused and non-abused child labourers did not vary in biased threat processing
- Abused youth with anxiety were slower to disengage attention away from threat
- Abused youth with depression endorsed more negative interpretations of ambiguity

Abstract

Background and objectives: Young people who have experienced early-life maltreatment preferentially attend to threat and draw more threatening interpretations. In turn, these threat biases may explain elevated risk for lifelong anxiety and/or depression. We investigated whether adolescent labourers with a history of physical abuse showed threat biases relative to non-abused labourers, and whether these threat biases associated with anxiety and depression. **Methods:** 100 young people (aged 13-18 years, 64% female) from Nepal rescued from illegal child work were assessed for childhood maltreatment and anxiety and/or depression disorders. Participants completed an emotional visual search task (to measure attention engagement of positive versus negative faces) and an ambiguous scenarios questionnaire (to measure the endorsement of negative versus benign interpretations). **Results:** Seventy young people reported a history of physical (and emotional) abuse. They were more likely to meet symptom thresholds for depression, and marginally, for anxiety disorders than non-physically abused participants. Abused and non-abused participants did not differ on attention engagement/disengagement of threat or on interpretational style. Abused participants with anxiety were slower to disengage from negative faces to engage with a positive face than non-anxious abused participants. Abused participants with depression endorsed more negative interpretations of ambiguous situations than those without depression. **Limitations:** The cross-sectional design limits our ability to infer whether threat biases reflect risk markers of psychopathology. **Conclusions:** If threat biases are shown to confer risk for anxiety and depression in future studies, they could be targeted in mental health prevention programs for these vulnerable young people.

Keywords: physical abuse; child labour; cognitive bias; anxiety; mood disorders

1. Introduction

Child labour - the employment of children and young people in the workforce in a way that contravenes global legal parameters - is a pressing human rights issue. Prevalent in many Low and Middle Income Countries (LMICs), child labour deprives young people of their education and future opportunities. Child labour is also associated with exposure to violence, incurring significant personal costs on mental health. Two recent studies of youth labourers from Nepal and India showed that between half to three-quarters reported some form of physical abuse, with just under half of each sample reporting emotional abusive experiences too (Dhakal et al. 2019; Pandey et al. 2020). These victimisation experiences were associated with affective disorders, consistent with other research demonstrating the effects of childhood abuse on subsequent anxiety and depression (Carr, Duff and Craddock 2018; Cecil, Viding, Fearon, Glaser and McCrory 2017). As untreated affective disorders can be persistent, disabling and costly, intervening to limit the affective "wounds" of victimisation in adolescent labourers should be an urgent priority within LMICs. Yet, individuals who have experienced prior abuse are more resistant to existing treatments (Nanni, Uher, and Danese 2012). Understanding and targeting the mechanisms that bridge early-life victimisation experiences and vulnerability to affective disorders such as anxiety and depression could address this interventive need (McCrory and Viding 2015). As "threat biases" in attention patterns and interpretational style have been linked to both childhood maltreatment and youth anxiety and depression (Lau and Waters 2016), here, we investigated the extent to which threat biases accounted for anxiety and depression problems in rescued youth labourers who had experienced high levels of physical abuse. We focus on adolescence as many anxiety and depressive disorders

emerge in this period and a time when interventions targeting information-processing biases could be especially helpful (Cohen-Kadosh et al., 2013). We focus on physical abuse as the most consistent findings of emotion-processing have been found in association with this maltreatment subtype.

A number of studies have been consistent in suggesting that abuse (specifically physical abuse and not neglect) is associated with biased attention processing. These biases manifest as greater attention engagement towards threat (Briggs-Gowan et al., 2015; Cicchetti & Curtis, 2005; Curtis & Cicchetti, 2011; Gray et al., 2016; Pollak, Cicchetti, Klorman, & Brumaghim, 1997; Pollak, Klorman, Thatcher, & Cicchetti, 2001; Pollak & Tolley-Schell, 2003; Pollak, Vardi, Putzer Bechner, & Curtin, 2005; Shackman, et al., 2007; Swartz, 2012). Data also broadly suggest that maltreated young people interpret ambiguous social cues displayed by peers as reflecting hostile and aggressive intent (Gusler & Jackson, 2017; Kay & Green, 2016; Pollak, Cicchetti, Hornung, & Reed, 2000; Richey, Brown, Fite, & Bortolato, 2016; Shahinfar, Fox, & Leavitt, 2000). While these “threat biases” may be adaptive in abusive environments, by alerting a young person of danger and escaping these situations, beyond these contexts, they may become maladaptive and place young people at-risk for anxiety and depression (Lau & Waters, 2017). Yet, little research has clarified how victimisation experiences such as physical abuse shape threat biases to influence anxiety. One study showed that attention biases explain the (concurrent) association between physical abuse and anxiety (Shackman, Shackman, & Pollak, 2007) while another two studies have shown that attention biases for threat were more prominent in victims of abuse who also had PTSD (Swartz et al., 2012; Pine et al., 2005), a condition which shares diagnostic features and cognitive correlates with anxiety. Even fewer studies have measured

abuse-linked interpretation biases in association with behaviour, with available data showing that hostile interpretations are linked with aggression (Shahinfar, et al., 2000).

Here, we measured and compared performance of youth labourers with and without a history of physical abuse on experimental tasks of attention deployment and in the interpretation of different types of age-relevant social and non-social situations. We expected to find main effects of physical abuse on attention and interpretation biases. Consistent with theoretical predictions that biased attention patterns and interpretational styles that favour threat reflect cognitive markers of risk for affective disorders in victimised child labourers, we also tested the hypothesis that among physically abused young people, these biases would vary between those with and without anxiety and depression. Of note, because some of the current study sample was part of a broader study formatively assessing the potential of cognitive bias modification training among physically abused young people, there were more participants with this abuse profile than those who without. This limited our capacity to assess whether attention and interpretation biases varied in non-abused young people with and without anxiety and depression. We selected our groups of youth labourers on the basis of physical abuse because the most consistent findings of biased threat-processing have been found in association with physical abuse rather than with other forms of abuse and/or neglect. In addition, overt behaviours associated with physical abuse may be easier to define and measure by these participants (relative to emotional abuse and sexual abuse). We focused on rescued labourers because threat biases are considered only 'maladaptive' and linked to affective disorders symptoms outside of abusive contexts, and rescued labourers are likely to have been removed from such exploitative contexts.

2. Materials and methods

2.1. Participants and procedures:

Young people with a history of illegal child work were recruited from 13 care homes in Kathmandu. Twenty care-homes were contacted of which 13 responded to our invitation to participate. To be eligible for the study, young people had to have worked illegally in the past, be aged 12-18 years, and to pass a simple reading exercise. In addition, because we were interested in comparing young people with and without a history of physical abuse, we selected young people who had experienced 3 or more physically aggressive/disciplinary acts in their lifetime into the physically-abused group (N=71) and young people who reported never having experienced physically aggressive/disciplinary acts into the non physically-abused group (N=29). Young people who experienced 1 or 2 physically aggressive or disciplinary acts were therefore not included in the study. We did this because we wanted to maximise group differences on threat-processing tasks, by selecting from extreme groups, with those experiencing "recurrent" acts into our physically abused group. Of note, we selected 3 acts or more because use of physical discipline is still relatively common in Nepal and anything fewer may be less indicative of recurrent conditions. Yet our previous study indicated that selection of 4 acts or more would impact the feasibility of recruitment efforts. Furthermore, because this present research was part of a broader programme aiming to develop and formatively evaluate a preventative cognitive intervention to ameliorate affective disturbances in this group, we recruited more participants with a history of physical abuse (N=71).

Demographic characteristics and other forms of abuse and neglect for each group are shown in Table 1. Ethical approval was sought from and granted by the Nepal Health Research Council (NHRC). The Research division of Rector's office of [redacted] University, and the Central Child Welfare Board also granted permission of the study. For all rescued youth, consent was sought from the care-home employees who acted as legal guardians prior to data collection; young people themselves were asked for assent after being presented with information about the project in written and audio format.

After providing consent/assent, care-home employees completed a demographic form about the participant (age, gender) and a short form about the young persons' labour background. To complete these forms, carehome employees were encouraged to consult case files for the young person. Questions on the form included how old the participant was when they first started working, how long they had been working before they were rescued, the number of days and number of hours they worked, the site of their illegal employment, and the primary reason for working. While carehome employees were completing these forms, participants were given a simple reading passage to read followed by comprehension questions. If they were able to respond to the questions, they completed the Juvenile Victimisation Questionnaire to assess the presence and absence of physical abuse and the Youth Inventory to assess current symptoms of psychopathology. Finally, they completed the two tasks measuring attention and interpretation biases for threat.

2.2. Measures and Materials

For all questionnaire measures used here, permission for cultural and linguistic adaptation of measures to the Nepalese context was sought from the publisher/author of the original English scales. Nepalese investigators translated the material, and then back translated these into English; discrepancies with the original version were identified by UK investigators and corrected by the Nepalese investigators.

2.2.1. Juvenile Victimisation Questionnaire (JVQ; Finkelhor et al., 2005): The JVQ assesses maltreatment history and other victimisation experiences and was used here to establish the presence and absence of physical abuse. Four of the 34 modules cover Child Maltreatment, asking young people to report on experiences of Physical Abuse, Psychological/Emotional abuse, Neglect and Custodial Interference. Across the events described within these 4 modules, participants are asked whether they had occurred in their lifetime. While follow-up questions also probed the nature, impact and severity of the event and, if applicable, details of the perpetrator across the lifetime experience, if the participant answered 'yes' to any of these events described in each module, they were scored as experiencing that type of victimisation. To be included in the physical abuse group, participants had to have experienced 3 acts of physical abuse and to be included in the control group, participants had to have experienced no acts of physical abuse. The English version of the JVQ has appropriate reliability and validity (Finkelhor et al., 2005).

2.2.2. Youth Inventory-4 (YI-4; Gadow et al., 2002): This is a 120-item self-reported scale that assesses potential psychiatric diagnoses consistent with the Diagnostic and Statistical Manual of Mental Disorders (4th ed.; DSM-IV) classification and criteria.

Participants are asked to consider how frequently they experience each item NOW on a 4-point scale (0 = never to 3 = very often). Cut-off scores on total symptom counts for each disorder are used to indicate whether participants meet the threshold for a diagnosis. As we have previously used the YI-4 to indicate potential diagnosis in samples of former child labourers, here we used the same categorical approach to indicate anxiety and/or depressive disorder. Participants who exceeded the symptom count threshold for generalised anxiety and/or social phobia and/or panic attacks and/or separation anxiety were allocated to the potential anxiety group, whereas participants who exceeded the symptom count threshold for major depression or dysthymia were allocated as the potential depression group. Nonetheless, as symptom counts are continuously distributed, we also used these in supplementary analysis.

2.2.3. Emotional visual search task (De Voogd, Wiers, Prins & Salemink, 2014): This task is thought to capture more strategic aspects of attention such as the flexible control of attention away from distractors to locate targets. Comprising 72 trials divided equally into "positive" and "negative" trials, participants are instructed to search as quickly as possible for a face from a grid of faces. In the 36 positive trials, participants search for 1 happy face from 15 negative faces (mix of angry, fearful, sad expressions), whereas in the negative trials, participants search for a negative face (angry/fearful/sad) from 15 happy faces. Once they have found the face, they are instructed to click on it as quickly as possible. The order of blocks was counterbalanced across participants. All faces were selected from the NimStim face databases. The faces were presented in greyscale in a 4x4 grid on the screen. Each trial started with a central fixation cross (500ms). The location of the target face within the grid was random; however, the

target face appeared in every grid location an equal number of times. The number of correct trials out of the 36 positive and negative trials was used to calculate the percentage accuracy for each block. The mean RT was calculated for each block using only correct trial responses and only trials where the RT fell within 3 standard deviations from the participant's mean RT for that block.

2.2.4. Interpretation Bias task: This task comprises 20 vignettes falling into one of four domains with 5 vignettes in each: ambiguous social situations with potential negative evaluation from others, ambiguous social situations with potential hostile intent from others, ambiguous achievement situations with potential performance failure, and ambiguous physical situations with potential bodily harm (see Figure 1 for examples). Consistent with previous interpretation bias tasks (e.g. Lau et al., 2020), each vignette is considered ambiguous because until the final sentence, it is unclear if the outcome/explanation of the situation is threatening or benign (including positive). Across different trials, participants are presented with both endings and asked to rate each ending in terms of likelihood on a Likert scale from 1 (not at all likely) to 5 (very likely). The task is computerised such that each trial begins with a central fixation cross (500ms), followed by the ambiguous vignette, read at the participants' own pace. The possible resolutions are then presented and also read at the participants' own pace before they are instructed to key in their likelihood rating. The vignettes were presented randomly and the order of threatening and benign resolutions counterbalanced across participants. The mean ratings for threatening and benign interpretations for each of the 4 domains were calculated.

2.3.Statistical analysis

Prior to performing any statistical analysis, the distribution of each variable was assessed for outliers and normality. We first investigated differences associated with physical abuse and gender ratio, age, other forms of abuse and with anxiety and depression potential diagnoses, using chi-square and independent sample t tests. We then investigated physical abuse linked differences on task performance on the emotional visual search task and the interpretation bias task. For the emotional visual search task, we conducted mixed 2x2 ANOVA, with trial type (negative, positive trials) and physical abuse group (presence, absence) on both accuracy and reaction time data. For the interpretation bias task, we investigated the effects of physical abuse group on ratings to negative versus benign interpretations of situations across different domains (hostile intent, social rejection, performance failure, bodily harm) using a 2x2x4 mixed ANOVA.

Finally, we assessed whether attention and interpretation biases associated with anxiety and/or depression problems in the physically-abused group only, using a series of mixed design ANOVAs. Mixed ANOVAs assessed anxiety and depression diagnoses as separate between-group factors on negative and positive trials on the emotional visual search data (accuracy and RT), where trial type was the within-group factor. Similarly, anxiety and depression diagnoses were included as between-subjects factors in a mixed design ANOVA, where domain (hostile intent, social rejection, performance failure, bodily harm) and valence (benign, negative) were within-subject factors. To supplement this categorical approach, we also created continuous anxiety and depression symptom variables, by adding together the symptom count scores for each

condition. Where a significant main or interaction effect involving anxiety or depression was found in the mixed design ANOVAs, we used these continuous symptom count scores in regression analysis to add support for their effects. While there was adequate (74%) statistical power to detect correlations of medium effect size (~0.30, two-tailed, $p < 0.05$)) in the participants with a history of abuse and neglect, the sample size of the comparison group (N=29) meant this was under-powered.

3. Results

3.1. General participant description

Participants were former child laborers, residing in child care facilities. Nepal is one of the countries with the highest number of child labourers, employing 1.1 million children aged 5-17(Nepal Child Labour Report 2021). These children come from economically disadvantaged families and underdeveloped parts of the country. If found to be employed under illegal working conditions (by being under the age of 14 years or engaged in hazardous work), children and young people are rescued by the governmental or non-governmental agencies working in child welfare and placed in care-homes, until they are reintegrated into their family or reach the legal age of maturity. The 100 participants in this study had worked for an average of 2.45 years before being rescued (SD = 1.53 years, min = 3 months, max = 8 years) by non-governmental or governmental organisations. The age that they started working as a child labourer varied from 5 to 16 years (mean age = 10.46 years, SD = 2.11 years). The number of days that young people worked as a child labourer ranged from 2 days to 7

days, with a mean of 6.37 (SD = 1.09). The number of hours worked per day ranged from 5 to 21 hours, with a mean of 11.82 (SD = 4.29). The most common site of work was in a house, as a domestic worker, with 44 falling in this category. The next most frequent site of work was in a factory (N=25) followed by working in a hotel or hostel (N=21). For 67 of the young people, poverty was cited as the reason for being employed as a child labourer. 12 of the young people had run away from home, and others had either experienced neglect (N=12) or were orphaned (N=8).

3.2. Demographic characteristics, maltreatment history and anxiety/depression symptoms of participants in each group

Demographic characteristics and other forms of abuse and neglect are shown in Table 1. The physical abuse group did not differ in terms of gender ratio ($\chi^2(1) = 0.07$, p = n.s.) nor age (t(98) = -0.21, p=n.s.) with the non-physically abused group. The two groups also did not vary in terms of being exposed to sexual abuse ($\chi^2(1) = 0.30$, p = n.s.), neglect ($\chi^2(1) = 0.80$, p = n.s.) and conventional crime ($\chi^2(1) = 2.40$, p = n.s.). However, those who had been physically abused also experienced more emotional abuse ($\chi^2(1) = 6.25$, $p < 0.05$).

The proportion of young people potentially meeting an anxiety or depression disorder in each of the physical abuse and no/low physical abuse groups are presented in Table 1 as well. Chi-square analysis revealed a significant association between physical abuse and a possible diagnosis of depression ($\chi^2(1) = 5.75$, p = 0.017), with the same association with a possible diagnosis of an anxiety disorder approaching significance ($\chi^2(1) = 3.48$, p = 0.062).

3.3. Effects of physical abuse on attention and interpretation biases

Accuracy to negative and positive trials on the emotional visual search task were not significantly different; there was also no significant main or interaction effect involving physical abuse group (All F's < 0.39). The mixed ANOVA comparing the physical abuse groups on reaction times to the negative and positive trials revealed only a significant effect of trial type ($F(1, 92) = 39.95$, $p < 0.001$), such that positive trials (those where participants identified a positive face from an array of negative faces) yielded longer reaction times to negative trials (where participants identified a negative face from an array of positive faces). This difference between conditions was moderate (Cohen's d = 0.70 95% CI = 0.46 to 0.95).

The mixed ANOVA comparing the physical abuse groups on their ratings to the benign and negative items across domains on the interpretation bias task also revealed no main or interaction effects involving physical abuse. Instead, there were significant main effects of domain ($F(3, 294) = 4.19$, $p < 0.01$, partial eta square = 0.15) and valence ($F(3, 294) = 103.66$, $p < 0.001$, partial eta square = 0.51) and of their interaction ($F(3, 294) = 14.89$, $p < 0.001$, partial eta square = 0.31). The main effect of domain was driven by negative *and* benign outcomes being endorsed more for potential performance failure than potential bodily harm ($t(99) = 2.73$, $p < 0.01$, Cohen's d = 0.26, 95% CI = 0.07 to 0.46) and social rejection ($t(99) < 3.75$, $p < 0.001$, Cohen's d = 0.31, 95% CI = 0.14 to 0.48), with ratings for situations around hostile intent, bodily harm, and social rejection, all similar (collapsed across benign and negative ratings; all t's > 1.34). The main effect of valence was explained by benign outcomes being higher than negative outcomes across all domains. However, the interaction between domain and valence emerged because this difference was

somewhat smaller (Cohen's d = 0.90) for situations around bodily harm than the other 3 domains (Cohen's d > 1).

3.4. Associations between attention and interpretation biases and anxiety and depression problems in the physical abuse group

Again, there were no significant effects of trial-type, anxiety or depression or their interactions on accuracy data on the emotional visual search task (All F's < 1.40). Within the physical abuse group, as well as the previous main effect of trial type ($F(1, 63) = 10.91$, $p < 0.01$, partial eta square = 0.15), there was an interaction between trial type (positive, negative) and anxiety (presence, absence) on reaction time data on the emotional visual search task ($F(1, 63) = 6.45$, $p < 0.05$ partial eta square = 0.10). The interaction between anxiety and trial type was driven by anxiety-differences on positive trials only ($t(66) = 2.87$, $p < 0.01$; Cohen's d = 0.24, 95% CI = -0.62 to 1.10, Figure 2), such that those with anxiety were slower at identifying the positive face from among negative faces. There was no main effect of anxiety or depression, nor were there interactions between depression and valence (all F's < 2.14).

Looking at ratings on the interpretation bias task in physically-abused participants only, there was as before, a main effect of valence ($F(1, 201) = 44.34$, $p < 0.001$, partial eta square = 0.40) and a significant interaction between valence and domain ($F(3, 201) = 2.90$, $p < 0.05$ partial eta square = 0.04). There was an additional valence-by-depression interaction ($F(3, 201) = 7.99$, $p < 0.01$, partial eta square = 0.11). This was explained by a depression effect on negative interpretations only ($t(98) = 3.22$, $p < 0.01$; cohen's d = 0.59, 95% CI = 0.09 to 1.10, Figure 3), where those with

depression endorsed negative interpretation more than those with no or little depression.

Of note, to explore whether these effects of anxiety and depression extended to a continuous analytic approach, we conducted two separate regression analysis for reaction time data on positive trials of the emotional visual search task and on rating data of negative interpretations across domains on the interpretation bias task. Both regression models were not significant ($F(2,67) = 1.01$, $p = 0.37$ for reaction time data; and $F(2,70) = 1.78$, $p = 0.17$). However, the standardised beta coefficients for the effects of anxiety symptoms on reaction time data to positive trials while controlling for depression symptoms (ß = 0.24) and the effects of depression symptoms on negative interpretation data while controlling for anxiety symptoms (ß = 0.17) were in line with the between-group effects when these variables were included as binary variables reflecting possible presence/absence of a diagnosis.

4. Discussion

In this study, we measured biases in attention towards/away from threat and in the interpretation of ambiguous (potentially threatening) situations in rescued child labourers, comparing a) those who had and had not been physically victimised and b) within physically abused young people, those who did or did not meet potential diagnostic criteria for anxiety and depressive disorders. Our data showed no effects of physical abuse on either biased attention patterns or interpretational styles. However, there were significant effects of anxiety and depression within the physically abused rescued labourers. Physically-abused young people with anxiety problems struggled more to disengage attention from negative faces to identifying a positive face,

compared to those who had been abused but with no anxiety problems. Those who had experienced physical abuse and potentially meet diagnostic criteria for depression problems endorsed more negative interpretations across different age-relevant situations than those who had been abused but with low levels of depression. Implications of these results are discussed in turn.

Our findings that physical abuse was neither linked with engagement or disengagement of threat nor the interpretation of ambiguous situations in a threatening way are somewhat inconsistent with previous findings showing biases in attention among physically-abused young people (Briggs-Gowan et al., 2015; Cicchetti & Curtis, 2005; Curtis & Cicchetti, 2011; Gray et al., 2016; Pollak, Cicchetti, Klorman, & Brumaghim, 1997; Pollak, Klorman, Thatcher, & Cicchetti, 2001; Pollak & Tolley-Schell, 2003; Pollak, Vardi, Putzer Bechner, & Curtin, 2005; Shackman, et al., 2007; Swartz, 2012. One possible reason that speaks to this could be the measure of biased attention used here. Whereas previous studies have tended to measure abuse-linked biases emerging at involuntary "early" stages of information-processing, here, we assessed an aspect of attention that was more strategic, arguably reflecting the capacity to flexibly inhibit and re-direct attention away from one emotional stimulus to another. Although a handful of studies have shown these more strategic biases in victims of abuse (Gray et al., 2016), in general, there have been few systematic attempts to delineate the specific component of attention that is distorted, and more behavioural and neural studies dedicated to clarifying this would be important. That there was also no clear effect of physical abuse on ambiguity resolution was somewhat unexpected. However, prior findings have also been mixed (Gusler & Jackson, 2017; Kay & Green, 2016; Pollak, Cicchetti, Hornung, & Reed, 2000; Richey, Brown, Fite, & Bortolato, 2016;

Shahinfar, Fox, & Leavitt, 2000); it may be that assessing interpretations through written scenarios of ambiguous situations do not reflect real-life situations, where situations are resolved negatively or benignly. Future studies including more ecologically-valid measures of interpretation bias are needed. Another reason for the discrepancy with both the attention and the interpretation findings could be that our non-abused control group have experienced other forms of interpersonal violence (e.g. being the victim of conventional crime), which could also shape threat biases in attention patterns and interpretational style – attenuating any differences between groups. Perhaps a more suitable design would be to measure and compare biases with a third group of young people that was age, gender and SES matched but who grew up without exposure to child labour.

A key justification for measuring threat biases in information-processing amongst child labourers with victimisation experiences is to examine whether these are associated with risk for affective disorders. Due to the low number of individuals reporting possible anxiety and/or depression diagnoses in the non-physically abused groups, we were unable to assess formally assess mediation. Instead, we compared the independent effects of anxiety and/or depression in those who had experienced physical abuse. Interestingly, despite the absence of clear-cut abuse-linked differences, within the abuse group, there were significant differences on attention and interpretation measures as a function of possible anxiety and depression diagnoses. These findings are somewhat consistent with previous studies showing that abuse-related attention biases are amplified when diagnosed with PTSD (Swartz et al., 2012; Pine et al., 2005), a condition that is no longer considered an anxiety disorder by diagnostic systems, yet continues to share some features with anxiety, such as fear,

avoidance and anxious arousal. The presence of anxiety within these physically-abused individuals appears to increase difficulties disengaging from negative stimuli, affecting the ability to detect positive ones. The presence of depression, by contrast, within the physically-abused group increased the tendency to endorse negative interpretations across a range of situations, not just limited to those signalling hostile intent or social rejection, but also to potential failure in academic and recreational activities and poor health and illness. If these findings are replicated in longitudinal mediation studies, this could justify the development of interventions that target biased attention and interpretation in young people who have experienced victimisation during illegal child work. While gold-standard cognitive behavioural therapies do challenge these biased information processing styles, unfortunately, such packages are costly to administer and may not easily be incorporated into service delivery in LMICs, particularly for who are the most marginalised within these societies. Training packages such as cognitive bias modification (CBM) could reflect a more attractive option. Yet, while recent data indicate the feasibility and acceptability of these interventions (Lau et al., 2020), data from first-generation CBM packages have not always been consistent in finding clinical effects (Cristea et al., 2015), and where positive effects are reported, these tend to be small (Krebs et al., 2018) – warranting more work in treatment innovations. The need to include young people with lived experiences and the key stakeholders will be important in such treatment development efforts, both to ensure the practicalities of delivering to individuals (e.g. ensuring engagement and compliance) and local services (e.g. fitting into existing infrastructure and resources).

4.1. Limitations

There are a number of limitations to our study. As this is a difficult to recruit sample, we did not use a priori power calculations to determine sample size. Post-hoc power calculations revealed that with our numbers we had 62% power (two-tailed) to detect a moderate effect size describing between-group differences in those who had and hadn't experienced abuse. We were therefore under-powered. A larger group of rescued labourers with and without abuse could also enable assessment of the differential impact of those with and without anxiety/depression in the presence of those with and without abuse. Moreover, ideally one would measure abuse, biased information-processing and anxiety/depression at 3 different time-points to assess temporal mediation. A second set of caveats is that while we describe the groups based on physical abusive experiences, there were also differences in emotional abuse too. It is therefore unclear whether findings reported here (including null findings) are attributed to physical or emotional abuse. Third, the validity of these measures, particularly the possible anxiety and depression diagnoses depend on young peoples' awareness and understanding of emotional symptoms. Mental health literacy is known to be poor in Nepal and could therefore undermine the reliability and validity of their responses. Finally, as we did not have access to young people's records (and indeed, this was largely because many children had run away from home or had been trafficked), we could not ascertain indices of socioeconomic status (which can be based on parental income or educational levels). However, as all these young people did have a history of illegal employment, this suggests that family SES was low.

4.2. Conclusions

In conclusion, we demonstrated that anxiety and depression in physically abused young labourers manifested through biased attention patterns towards and away from threat and in the interpretation of ambiguous situations. It could be that these aspects of information-processing are 'latent factors' that confer risk for affective disorders over a longer time-frame, beyond that assessed in the current cross-sectional design. If these associations are verified by later research, this can allow efforts to turn to much needed treatment innovation in these low-resource settings.

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Table 1. Demographic characteristics and abuse history of participants

	No physical abuse (N = 29)	**Physical abuse (N = 71)**
Mean Age (SD)	15.15 years (SD = 1.25 years)	15.20 years (SD = 1.13 years)
N (%) Female	18 (62%)	46 (65%)
N (%) Anxiety	8 (27.6%)	34 (47.9%)
N (%) Depression	3 (10.3%)	24 (33.8%)
Sexual abuse	16.7%	21.4%
Emotional abuse	13.3%	38.6%
Neglect	20%	28.6%
Victim of conventional crime	86.7%	97.1%

Figure 1. Example vignettes describing ambiguous situations from the Interpretation Bias Task

Ambiguous social situations with potential negative evaluation You arrive late to a party. Everyone else is in a group and talking to other people. As you walk over to join one of these groups, they all turn to stare at you. This is because you look at-ractive Do you think you will find it easy to fit into the group?	**Ambiguous social situations with potential hostile intent** You have bought a new phone. At lunch, your friends want to take a look. When you get the phone back, you notice a crack on the screen. Someone did this… acc-dentally Did your friends intentionally break the phone screen?
Ambiguous achievement situations with potential failure You have signed up to do basketball training. After the first training session, the coach calls you over. They say.. well d-ne Did the coach think you were good at basketball?	**Ambiguous physical situations with potential bodily harm** You turn up on the first day of school and feel very short of breath. This is because you were… l-te Did you run to school this morning because you were late?

Figure 2. Anxiety-linked differences in RT on negative and positive trials on the emotional visual search task in participants who had experienced physical abuse

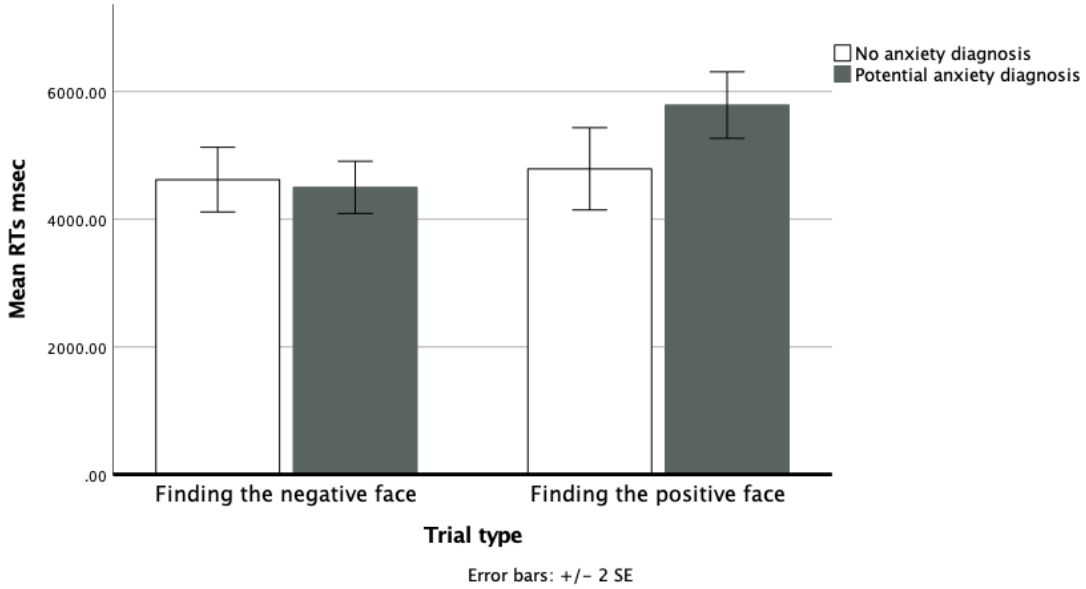

Figure 3. Depression-linked differences in ratings of benign and negative interpretations on the interpretation bias task in participants who had experienced physical abuse