Can we challenge attention and interpretation threat biases in rescued child labourers with a history of physical abuse using a computerised cognitive training task? Data on feasibility, acceptability and target engagement

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Abstract

Child labourers are more likely to have experienced physical victimisation, which may increase risk for anxiety/depression, by shaping threat biases in information-processing. To target threat biases and vulnerability for anxiety/depression, we evaluated whether Cognitive Bias Modification (CBM) training could be feasibly and acceptably delivered to rescued youth labourers. Seventy-six physically abused rescued labourers aged 14-17 (40 from Nepal, 36 from India) in out-of-home care institutions received either multi-session computerized CBM or control training. Training targeted attention away from threat to positive cues and the endorsement of benign over threat interpretations. Feasibility and acceptability data were gathered along with pre and post intervention measures of attention and interpretation bias and emotional and behavioural symptoms. In terms of feasibility, uptake (proportion of those who completed the pre- intervention assessment from those who consented) and retention (proportion of those who completed the post-intervention assessment from those who completed the pre-intervention assessment) were above 75% in both countries. Average acceptability ratings were mostly 'moderate' on most indices for both countries, and none of the participants reported experiencing serious adverse events or reactions in response to or during the trial. Secondarily, CBM participants showed increased attention to positive and decreased attention to threatening stimuli, as well as increased endorsement of benign interpretation and decreased endorsement in negative interpretations of ambiguous social situations. Symptom changes were less clear. Delivering CBM to former child labourers in out-of-home care institutions has interventive potential.

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Key Words: Childhood victimization, cognitive training, physical abuse, threat bias, selective attention.

"Child labour" refers to the illegal employment of children but also young people in the workforce in a way that contravenes global legal parameters. Whilst present worldwide, child labour is particularly common in low-to-middle income countries where it affects the most economically-marginalised sectors, depriving young people of their education and future opportunities. Recently, by gathering victimization histories from over 200 rescued adolescent labourers in India and Nepal, we found widespread exposure to violence including physical, sexual and emotional abuse in these young people (Dhakal et al. 2019; Pandey et al. 2020). Such abuse was associated with poorer mental health including a higher incidence of anxiety and affective disorders (Dhakal et al. 2019; Pandey et al. 2020). Our data are consistent with other findings that childhood maltreatment precipitates emotional and behavioural problems (Carr, Duff and Craddock 2018; Cecil, Viding, Fearon, Glaser and McCrory 2017) and can lead to long-term and costly physical and mental health problems (Beecham 2014; Chorozoglou et al. 2015; Doshi et al. 2012; Romeo, Byford and Knapp 2005; Snell et al. 2013). Intervening to limit the affective "wounds" of victimisation in adolescent labourers should be an urgent priority for health-care professionals, educators and policy-makers in Low and Medium Income Countries (LMICs). The current study presents an evaluation of feasibility and acceptability of an intervention to improve affective symptoms in young people with a history of illegal labour from India and Nepal who had experienced abuse.

Targeting 'latent vulnerability factors' known to mediate the relationship between childhood maltreatment and poor mental health could form the basis of targeted interventions to reduce the adverse effects of childhood adversity (McCrory and Viding 2015). One set of risk factors linked to childhood maltreatment are "threat biases" (Lau and Waters 2017). Indeed, theories of early life-stress suggest that while threat biases in attention and interpretation alert an individual to potential danger in adverse family environments (Pollak 2012), beyond these environments, such threat biases could become maladaptive and contribute to problem-behaviours such as anxiety (Lau and Waters 2017). In support of this, various experimental tasks have shown selective attention towards threat (Briggs-Gowan et al. 2015; Cicchetti and Curtis 2005; Pollak, Cicchetti, Klorman, and Brumaghim 1997; Shackman, Shackman and Pollak 2007). This bias is apparent even when the emotional intensity of stimuli has been lowered (Gibb, Schofield, and Coles 2009), suggesting that the tendency to attend to

threat is involuntary. However, difficulties with the flexible deployment of attention (Gray, Baker, Scerif, and Lau 2016) have been found, suggesting problems with attention control too. Among maltreated adolescents, attention biases for angry faces has been found to correlate with anxiety symptoms (Briggs-Gowan, et al. 2015). Tentatively, these data support the prediction that biases can become maladaptive and linked with psychopathology. Victims of childhood maltreatment also tend to interpret ambiguous social situations as threatening and to reflect hostile intent than their non-maltreated peers (Gusler and Jackson 2017; Kay and Green 2016; Pollak, Cicchetti, Hornung, and Reed 2000; Richey, Brown, Fite, and Bortolato 2016; Shahinfar, Fox, and Leavitt 2000). Among youth offenders who had witnessed violence, interpretation biases also correlated with greater perceived certainty that aggressive behaviour was an appropriate response to particular situations (Shahinfar et al. 2000) though no studies have reported an association between interpretation bias and anxiety in victims of maltreatment. Targeting biased attention and interpretation patterns in early interventions could help reduce affective problems in young people exposed to maltreatment experiences, including victimisation.

Over the last decade, cognitive bias modification (CBM) training programmes that target attention and interpretation biases for threat have been developed and implemented in adults with a range of psychiatric conditions (Cardi et.al. 2015; Liu, Li, Han, and Liu 2017; Macleod, 2012; Wiers et al. 2015), and extended for use in children and young people, largely with anxiety and depression. Early studies of the cognitive bias modification of attention (CBM-A) using a visual dot-probe task, yielded weak changes in attention bias and on measures of anxiety (Cristea, Mogoase, David, and Cuijpers 2015). In a different paradigm, the visual search task, participants are presented with a grid of faces displaying varying emotions and asked to identify a benign/positive target (smiling face) from an array of threatening/negative distractors (angry/fearful/sad faces). Findings from studies using this task in young people have showed relatively more consistent improvements in anxiety symptoms (De Voogd et al., 2014; De Voogd et al., 2017; De Voogd et al., 2016; Waters et al. 2015; Waters et al., 2016; Waters et al., 2019). As visual search training is thought to boost attentional control mechanisms (by using effortful goal-directed instruction to identify positive stimuli and inhibit involuntary attention towards negative stimuli; Mogg, Waters, and Bradley 2017), this could

be appropriate for maltreated young people given data suggesting difficulties in both involuntary and voluntary aspects of attention processing (Gray et al. 2016). Cognitive Bias Modification of Interpretation (CBM-I) training tasks have also been used in children and adolescents (Lau 2013). Most studies use a variant of the task that presents incomplete hypothetical ambiguous scenarios, which a participant is instructed to read and complete a word fragment at the end. By correctly completing the word, participants endorse benign/positive interpretations of ambiguous situations – which may become more habitual across training trials. A meta-analysis of youth CBM-I studies (Krebs, et al. 2017) showed expected changes in interpretation biases, and weak but significant improvements on anxiety symptoms. These weak effects across studies may occur because many of these relied on single-session training in unselected (non-symptomatic) young people (Lau et al., 2021). To boost the effects of CBM-A and CBM-I, some studies have targeted biases in parallel (Biagianti, Conelea, Brambilla and Bernstein. 2020; Lisk, Pile, Haller, Kumari and Lau 2018), on the basis that cognitive factors do not act in isolation but rather correlate and interact to influence psychopathology (Baker et al. 2018).

There are a number of advantages to delivering CBM to young people at-risk for emotional and behavioural maladjustment following victimisation. First, data suggest that maladaptive cognitive styles stabilise and become increasingly linked with emotional symptoms across youth. Challenging these during a period of enhanced learning and flexibility may therefore be especially important before they become habitual and entrenched. Second, for young people who may find the verbal demands of face-to-face therapy challenging, a computerised interface may be less daunting and more engaging. Finally, as such training programmes can be administered by a non-specialist practitioner, these interventions could be easier to embed within local services – a feature that could be advantageous in lower-resource settings. Yet, despite this, to our knowledge, there have been few CBM-A and CBM-I training studies of young people with a history of psychosocial adversity, with most clinical or at-risk studies focusing on young people with anxiety and/or depression. Accumulating data suggest that depressed adults with a history of abuse respond less well to traditional treatments than those without this history (Nanni, Iher & Danese, 2012). We therefore cannot assume that intervention evaluation parameters of feasibility and acceptability are the same in

young people who have experienced multiple forms of victimisation as those without such complex histories. It is possible that the same training materials may evoke different responses and vulnerabilities. There is also increasing recognition that intervention evaluation parameters may interact with the target populations' unique sociocultural demographic profile and the contexts and settings in which the intervention is delivered in real-world settings, yielding different findings. Given that it is important to explore intervention development independently in young people with a history of victimisation in low-resource settings, in a recent case series, we delivered 5 modules of CBM-A and 5 modules of CBM-I training across 5 training sessions to 19 young people who had experienced victimization in the UK (n=9) and in Nepal (n=10) (Lau et al. 2020). We found high acceptability of this package in young people across cultures, with most finding the training helpful and the training materials realistic. There were also reductions in many symptom domains. However, this pilot study lacked a control condition, so feasibility and acceptability of the entire intervention protocol within a randomized controlled trial (RCT) was not assessed. There was also no assessment of whether the training protocol engaged the intervention targets of attention and interpretation biases, limiting the utility of the findings. Here, we extended our previous investigation using a RCT.

Research objectives

Our primary objectives were to a) assess feasibility of implementation within local care provision for young people with a history of illegal labour and b) gain an understanding of acceptability, safety, and tolerability. Our secondary objective was to estimate effect sizes of between-group differences on the hypothesised intervention targets (biased attention, interpretation) and a range of emotional and behavioural symptoms at post-intervention. 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. To enhance the generalisability of our findings across LMICs, we recruited parallel groups of rescued adolescent labourers with a history of physical abuse in India and Nepal. While these countries share sociocultural similarities, warranting a common intervention approach, differences in patterns of illegal labour and service infrastructure, enables us to draw conclusions around the extent of generalisability of this potential intervention approach.

Methods

Design

This study consisted of a feasibility randomised controlled trial with parallel groups of young people who had experienced physical abuse recruited from care-homes in Nepal and India. The trial was registered with ClinicalTrials.gov (Identifier: NCT03625206), https://clinicaltrials.gov/ct2/show/NCT03625206. We compared CBM with a control training condition. Recruitment of participants into the study occurred between July 2018 and December 2019.

Participants

Seventy-six young people aged 14 to 17 years participated in the study (see Table 1 for demographic characteristics). Forty participants from Nepal (17 males; mean age=15 years 2 months, SD=1 year 3 months) were recruited across 5 care-homes in Kathmandu, while 36 participants from India (all males; mean age=15 years 1 month, SD=1 year 1 month) were recruited from 6 care-homes in Varanasi. As the purpose of this trial was not to establish efficacy, a power calculation to determine sample size is not appropriate. Therefore, instead, our sample sizes within each site were selected to be consistent with good practice recommendations for such trials, which recommend sample sizes of between 24 and 50 (e.g. Lancaster, Dodd, & Williamson, 2004). In general, care-homes in both countries provide residential facilities for those illegally working including street children and orphans, and/or young people living in poverty. Inclusion criteria across participants were aged 14-18 years and reported a history of physical abuse, defined using a single item from the Juvenile Victimisation Questionnaire. Exclusion criteria were difficulties in reading; difficulties in understanding materials that were being read to them; those who were currently at-risk for self-harm; and currently experiencing psychotic or high-level trauma symptoms.

Procedures

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Ethical approval was

given by the Nepal Health Research Council (Ref. No. 1386; 14 February 2017) and the Institute of Medical Science Ethics Research committee of Banaras Hindu University (Ref. No. 265). Permission for data collection in Nepal child care-homes was obtained from the Research Division, Office of the Rector, Tribhuvan University, and from the Central Child Welfare Board (CCWB) under the Ministry of Women, Children and Social Welfare. Informed consent was sought from legal guardians and young people prior to completion of any study assessment.

All assessments and training took place in quiet rooms in the care-homes in Nepal; for Indian participants, most (92%) completed assessments in care-home facilities with three participants completing these at the University testing facilities. Whether participants completed the assessments and training in care-home facilities or at the University, these were administered using laptops supplied by the research team. At each site, one research psychologist (NPS, SG) administered the training sessions; these researchers were not blind to training group but were not involved in collecting any of the symptom measures. The trained research psychologists at each site (SD, AU) who administered the pre and post-intervention assessments were 'blind' to group status and this was maintained until analyses were completed after the final participant of the study completed their post-intervention assessment. On Days 1 and 2 of their individual schedule, all participants completed pre-intervention measures which were designed to characterise the sample (demographics, history of victimisation, psychopathology, and cognitive ability) and probe baseline emotional and behavioural symptoms, and biases in attention and interpretation. Training sessions were scheduled across Days 3-7, with each 20-minute session including one module of CBM-I training and one module of CBM-A. On Days 8-9, all participants completed the post-intervention assessments that comprised the same measures of emotional and behavioural symptoms, and biases in attention and interpretation at pre-intervention. In addition, participants were asked to provide feedback regarding acceptability and feasibility of the training. Due to ongoing curricular and extra-curricular activities, not all training sessions occurred on consecutive days but were mostly completed in a 2-week period (Nepal Mean=12 days, India Mean=5.22 days). A random sequence generator (generated by the UK research team) allocated participants to the CBM or control intervention groups. Consequently, in Nepal, 22

participants were assigned to the CBM and 18 to the control group; in India, 18 were assigned to the CBM and 18 to the control groups.

Interventions

CBM Intervention: A combined Cognitive Bias Modification training programme based on our earlier case series (Lau et al 2020) was administered during each of the 5 training sessions (translated appropriate for each site). CBM of attention used a visual search attention training task, in which, across training trials, participants were required to identify the only positive (smiling) face in a 4x4 matrix consisting of 15 other negative faces (5 fearful, 5 sad, and 5 angry). Each trial began with a white fixation cross presented in the centre of the screen, which participants must move their cursor on to, before a 4x4 grid of faces was presented. This appeared until the participant correctly responded to the smiling face. If a wrong face (negative face) was identified, the participant was given feedback to 'Try Again!', and the same grid (with the same configuration and location of faces) would re-appear. Once the correct target face was identified, a 500ms inter-trial interval occurred. In total, there were 72 trials per training session, divided into 4 blocks of 18 trials. After every 18th trial there was a self-timed break. To the right of the grid, a bar highlighting the participant's progression across the task was presented. For each grid of faces, the positive target face was chosen at random from 18 positive faces from NimStim (Tottenham et al. 2009), with each target appearing 4 times across the 72 trials in the different grid locations an equal number of times. The 15 negative faces in each grid were also chosen at random from the 18 negative NimStim faces (6 fearful, 6 sad, and 6 angry faces). Accuracy and time taken to correctly identify the positive face was recorded for each trial.

CBM-I training involved presenting participants with text-based hypothetical scenarios that included a missing word, usually in the middle of a sentence. Participants were asked to say the missing word out loud, which if correct, would disambiguate the scenario in a benign direction. Following correct identification of the word, the participants would be given a comprehension question (yes/no), designed to reinforce the interpretation. For half of the comprehension questions, the correct answer is 'yes' and for the other 'no' to ensure concentration on the task, which the participant indicated with a keypress. Across 5 training sessions, there were 150 scenarios (30 per

session) that captured daily life ambiguous situations (around potential social threat e.g. peer rejection, or around physical threats e.g. hostility from others). Researchers first developed the material following a literature search of interpretation bias studies in general and in young people who had been exposed to maltreatment specifically. Then, these were presented to social work and educational professionals working with young people with histories of adversity in Nepal and India, where they were finalised for relevance to youth in each of these settings.

Control intervention: For the control version of CBM-A, participants had to find and click the one house with circle rather than square windows from a grid of houses. The composition of each trial (fixation, grid, feedback bar, rest), the selection of stimuli for each grid, and the number of trials per blocks were matched to the CBM-A condition. For the control version of CBM-I, participants were presented with incomplete emotionally-neutral scenarios that also represented daily-life situations. As with the format of CBM-I training trials, they had to identify a missing word and respond to a comprehension question. We acknowledge that the presentation of emotionally-neutral information in the control condition of a CBM-A and CBM-I study is not typical. However, this was because of the expected vulnerability of the sample as revealed in our prior studies (exposure to exploitation and victimisation that is linked with affective disturbances; Dhakal et al., 2019; Pandey et al., 2020) and safety concerns. We were concerned about the possible negative mood induction effects of displaying negative faces as part of the control training if we did not instruct participants to direct attention away from these. Similarly, we did not want to present ambiguous stimuli that remained unresolved and therefore potentially negative.

Pre-intervention assessments

Sample characterisation: Participants reported on their gender and age. Participants were interviewed using translated versions of the Juvenile Victimisation Questionnaire (JVQ, Finkelhor, Hamby, Ormrod and Turner 2005) and Youth Inventory-4R (YI-4R) (Gadow et al. 2002) that we developed in our previous studies. For the JVQ, we used all 4 modules of the Child Maltreatment domain, including additional 5 supplementary neglect items; two modules of the Sexual Victimisation domain, and abbreviated versions of the Conventional Crime and Witnessing and Indirect

Victimisation modules to index participants' previous victimisation history. More specifically, these data established the presence or absence of physical abuse as well as verbal/emotional abuse, sexual abuse, and neglect, and their severity, chronicity and extrafamilial/intrafamilial origins. Data from the YI-4R was used to evaluate history of possible DSM-IV disorders. Participants were also administered 2 subtests (Matrix Reasoning and Block Design) of the Wechsler Abbreviated Scale of Intelligence – Second Edition (WASI-II; Wechsler 2012) by a trained researcher. The raw scores from these subscales, designed to tap various non-verbal reasoning abilities, were converted to T-scores before creating a composite Perceptual Reasoning Index (PRI).

Measures of attention bias: The emotional visual search task (EVST) assessed participants' attention patterns towards and away from threatening stimuli (Lisk et al. 2018). This task was similar to the training task except participants completed two blocks, the order of which was counterbalanced across participants. In addition, stimuli appearing in this task were distinct to those presented in CBM-A training. One block required participants to identify (using their mouse cursor) a single positive happy face from an array of negative faces (all presented in a 4x4 grid) across 36 trials. In the second block, participants located the face with a negative emotion from a 4x4 grid of happy faces again across 36 trials. Accuracy and response time (RT) for each trial were recorded and used to generate mean values for each Block. While RT data was used to infer attention biases for threat, accuracy data was used to show participants' understanding and adherence to the task instructions. Average accuracy across trials for each block was over 90% in both the CBM and control conditions in each country at pre- and post-intervention. Specifically, accuracy on the negative face search conditions varied between 94.06 to 97.01, while accuracy on the positive face search varied between 90.6 to 95.38.

Measures of interpretation bias: Similar to a task reported in Lau et al (2020), participants read 20 hypothetical ambiguous scenarios that were incomplete because of a missing word/character (Lisk et al. 2018). These scenarios were distinct to those presented in CBM-I training. At the end of each scenario, participants were presented with two words – one that resolved the situation in a benign direction and a second that resolved in a threat direction. Participants rated each word/outcome for its likelihood on a scale of 1-5 (1=Not likely, 5=Very likely). Scenarios presented social or physical

threat. The presentation of scenarios and the order of threatening and benign sentence endings within scenarios was randomized across participants. The mean ratings across threatening and benign interpretations across domains (social, physical) were calculated.

Measures of emotional symptoms: Translated versions of the Strengths and Difficulties Questionnaire (SDQ) (Goodman, 1997) were completed by participants (the Nepalese translated version of the SDQ was first described by Dhakal and colleagues (2019) while the version used by India participants was described by Pandey and colleagues (2020); both versions appear on the SDQ website: https://www.sdqinfo.org/py/sdqinfo/b0.py). Although all twenty-five items (that tapped 5 subscales emotional symptoms, conduct problems, hyperactivity/inattention, peer relationship problems, prosocial behaviour)) were completed by participants, only emotional symptoms are reported here given these are directly targeted and may improve through CBM training. Participants rated each item on a 3-point Likert scale where 0=not true and 2=certainly true. Internal consistency statistics for this subscale were broadly acceptable. In the Nepal sample, the Cronbach's alpha for emotional problems was 0.679 and 0.741 for the pre and post-intervention data respectively. For the India participants, Cronbach's alpha was 0.627 and 0.689.

To measure more specific anxiety symptoms, translated versions of the general and social anxiety subscales of the Screen for Child Anxiety Related Disorders (SCARED) – Child Version (Birmaher et al. 1997) were completed by all participants. Questionnaire items were translated and back-translated, and the back-translations compared to the original translations by the corresponding author (JL). Where there was a mis-match between these translations, the item was translated again using different words/phrases and back-translated again, until there were no perceived discrepancies. Each item across these subscales was rated on a 3-point Likert scale based on the frequency with which they were experienced. Internal consistency statistics for each of the subscales were mostly acceptable with two of the post-intervention measures reflecting low reliability. In the Nepal sample, the Cronbach's alpha for general anxiety was 0.709 and 0.782 for the pre and post-intervention data respectively and for social anxiety, these statistics were 0.799 and 0.553 for pre- and post-intervention data. For the India participants, Cronbach's alpha for general anxiety was 0.777 and 0.757 for pre and post-intervention data, and for social anxiety, these were 0.711 and 0.641.

Post-intervention assessments

The same measures of attention and interpretation bias and emotional and behavioural symptoms (SCARED, SDQ) were administered again at post-intervention.

Feasibility: To determine feasibility, we collated the following (i) Number of potentially eligible participants. (ii) Number of participants whose guardians have consented to take part in the intervention. (iii) Number of participants that completed the pre-intervention assessment. (iv) Number of participants randomised (v) Number of participants who dropped out and reasons for this. (vi) During the intervention: range and average number of sessions completed (including number of sessions attended as a proportion of those offered). (vii) Data completeness for each questionnaire was summarised, i.e. number of participants who completed each questionnaire at each time point. (viii) Any unexpected adverse effects of participating in the trial was recorded. We considered the intervention to be feasible if uptake (proportion of those who completed the pre- intervention assessment from those who consented; percentage of training sessions completed) and retention (proportion of those who completed the post-intervention assessment from those who completed the pre-intervention assessment) were all at least 75%.

Acceptability, safety and tolerability: To assess the acceptability of the interventions, we used a self-reported feedback questionnaire used in our earlier case series; these were presented to participants in Nepalese and Hindi respectively. Young people were asked to rate on a 4-point Likert scale whether they found the training useful, engaging, realistic, and whether it impacted anxiety, mood, and coping strategies (1=Not at all, 2=A little bit, 3=Moderately, 4=Definitely). One item asked the young person to rate on a 3-point Likert scale, the likelihood of them completing the CBM in their own time (1=No definitely not, 2=May be, 3=Yes definitely). There were also open ended questions for young people to leave their feedback on aspects they found helpful/liked, unhelpful/disliked, and suggested improvements or general comments. However, to be considered acceptable, we expected average quantitative ratings to be rated as “moderately” (3 or above) across indices. Finally, the presence and quantity of serious adverse events (SAEs) that were recorded were

used to index safety and tolerability – with any that were recorded impacting subsequent decisions to proceed to a definitive trial.

Statistical analysis

Our primary research question was to assess feasibility (presented through a CONSORT diagram) and acceptability (averaging quantitative responses from the acceptability questionnaire). As this is a feasibility trial, significance-testing of within or between-group changes is not appropriate. However, we report descriptive statistics for cognitive (attention, interpretation) and symptom measures for each group (CBM, control) at the two time points (pre, post). Given differences in infrastructure/resources and sociocultural norms between Nepal and India, we reported these for each site separately to provide more information on how these formative evaluation parameters may vary across differences in sociocultural practices of the sample and the local context and settings. We also estimated between-group mean differences (and 95% confidence intervals) using ANCOVA for the measures of symptoms and cognitive bias. The post-intervention score was the dependent variable with group (CBM versus control) as a fixed factor and the pre-intervention score as a covariate. Between-group effect sizes were estimated using Cohen's d. This was calculated by dividing the mean difference at post-intervention (from the relevant ANCOVA) by the pooled (cross-group) pre-intervention standard deviation. As the mean difference value reflected the CBM group mean subtracted from the control group mean, a positive effect size for symptom measures reflected a between-group difference in the desired direction (after controlling for pre-intervention differences). This was also true for the 'threatening' bias measures, that is, the endorsement of threatening interpretations (of social and physical threat) and the RT for the negative face search. However, for the endorsement of benign/positive interpretations and RT for the positive face search, a negative effect size reflected a between-group difference in the desired direction (after controlling for pre-intervention differences). For brevity, only effects where Cohen's $d>0.2$ will be presented with 95% confidence intervals and commented on.

Results

Sample characterisation

Table 1 presents the gender distribution, mean age, and victimisation history among Nepal and India participants, stratified by intervention group. Among Nepalese participants, there were no significant differences in gender distribution ($X^2(1) = .05$, p=.82) or on mean age (t(38)=-.30, p=.77) between groups. Nor were there significant differences in severity of physical abuse between the CBM (M=6.73, SD=2.12) and control groups (M=6.50, SD=2.50); t (38) =.30, p>.05., or the experiences of any other forms of victimisation, all *p*'s>.26 (**Table 1**). Similarly, among the India participants, as all were males, there no difference between groups on gender distribution. Nor were there group differences in mean age (t (34) =-.17, p=.86); and in physical abuse severity between the CBM (M=2.11, SD=1.57) and control groups (M=2.00, SD=1.78); t(34)=-.199, p>0.05. There were also no significant differences in reported experiences of other forms of victimisation; p's>.18. The numbers of participants in each group at each site who met symptom thresholds for other common psychiatric disorders in the past are presented in Supplementary Table 1. No differences between groups at either site emerged in anxiety and depression symptoms, all p's>.15. Finally, on non-verbal cognitive ability, the Perceptual Reasoning Index for Nepalese participants in the CBM and control group were 98.27 (15.77) and 95.67(17.14), t(38)=-.50, p= .62; for Indian participants, these were 73.72 (14.74) and 77 (16.55), t(34)=.63, p=.54.

Feasibility data

Flow of participants through our recruitment and trial phases are presented in Figure 1 for each site. This includes number approached, number potentially eligible, number consented, number completing pre-intervention assessment, number randomised, and number who completed the intervention and post-intervention assessments with number withdrawing and the reasons for this, at each stage). In terms of our defining criteria for feasibility, the proportion of those who completed the pre- intervention assessment from those who consented was 84% and the percentage of training sessions completed was 100%, reflecting good uptake. In terms, of retention, 78% completed the post-intervention assessment from those who completed the pre-intervention assessment. For Indian participants too, the mean number of intervention sessions completed by all 36 participants (across

both groups) was 5 (SD=0; 100%, the maximum possible). The proportion of India participants who completed the pre-intervention assessment following consent was 100% and the proportion of those who completed the post-intervention assessment from those who completed the pre-intervention assessment was 78%. Across both groups from Nepal, data completeness for each measure at pre- and post-assessment was 100% for the symptom questionnaires (SCARED, SDQ). For the tasks tapping cognitive biases (attention bias, interpretation bias) at post-assessment, these were 95% for the attention bias measure and 100% for the interpretation bias measure. In India, data completeness for the attention bias task and the symptom measures (SCARED, SDQ) at pre- and post-assessment were 100%, but 97.22% for the interpretation bias task (at both time-points) due to technical difficulties.

Acceptability

Mean ratings for each question are presented in **Table 2** along with a summary of responses to the open-ended questions (across both countries) about which aspects were helpful, unhelpful, and general improvements/comments. Data from control participants are presented for full transparency but also to benchmark the data from the intervention group. Of note, not all participants responded to the open-ended questions; where participants indicated a response, these are all included in Table 2.

Nepalese participants: Across items, CBM participants gave average ratings of 3.04, which reflects moderate acceptability. In terms of individual questions, 7 of these were at least "moderate" acceptability, with the remaining 4 showing average ratings that were closer to "moderate" than a "little bit" – thus broadly confirming acceptability. None of the participants reported experiencing serious or any adverse effects from either intervention suggesting that the intervention appeared safe and tolerable.

Indian participants: Average acceptability ratings across the 11 questions used to probe acceptability, in CBM participants, was 3.08, again reflecting moderate acceptability. 6 questions showed average ratings that were at least "moderate", with the remaining 5 showing average ratings that were closer to "moderate" than a "little bit" – again, broadly confirming acceptability. None of the participants reported experiencing serious or any adverse effects from either intervention suggesting that the intervention appeared safe and tolerable.

Between-group mean differences on cognitive measures

Table 3 displays the means and standard deviations of cognitive measures before and after the intervention and the effect size of the changes. Here, we discuss effect sizes of between group differences in pre-to-post changes on each cognitive measure. In terms of attention bias changes, large between-group differences emerged in RTs to negative and positive face identification in the India participants, with those in the CBM group being quicker at locating positive faces and slower at locating negative faces than control participants. In contrast, data from the Nepal participants showed near-zero between group effects on both the positive and negative face finding conditions. Participants in both countries who had been allocated to receive CBM training showed small reductions in the endorsement of negative interpretations of ambiguous situations and small increases in the endorsement of benign interpretations across ambiguous situations in the CBM participants, relative to the control participants.

Between-group mean differences on emotional symptoms

Descriptive statistics along with effect sizes of the between-group differences at post-intervention (after controlling for pre-intervention differences) are presented in **Table 3**. Among the Nepal participants, those in the CBM group reported lower generalised anxiety symptom scores than those in the control group with moderate effect size. However, the extent of this between-group difference did not appear to generalise to social anxiety symptom scores, nor to the SDQ emotional symptoms subscale. These between-group effects also did not extend to Indian participants, where symptom changes were generally weak.

Discussion

The primary objective of this study was to explore the feasibility and acceptability of a combined cognitive bias modification (CBM) of attention and interpretation training in young people known to be vulnerable to mental health problems in general and emotional disorders in particular (Dhakal et al. 2019; Pandey et al. 2020). It is important to note that findings reported here relate to delivering

training to vulnerable young people aged 14 to 17 years, and may therefore not generalise to younger adolescents (those aged 11-13 years), emerging adults (those aged 18-24 years) or pre-adolescent children (those aged 10 and under). Drawing on feasibility criteria (some based on prior cognitive behavioural intervention protocols for young people e.g. Pile et al., 2021), our intervention met these thresholds, with uptake and retention at least 75%. Across both sites, all participants who were eligible for the study agreed to participation. Where drop-out did occur (N=1, Nepal; N=10, India), this was largely due to conflicting school-based commitments. Where there was missing data on a study outcome measure, this was due to identifiable technical errors in administering an experimental task (India) rather than participant-led discontinuation. One might argue that these feasibility data on uptake and retention are an artefact of administering a psychological intervention to a "captive audience" via the care-home. Nonetheless, using the space and structure provided by these institutions appears a viable option to increase access and ensure regular attendance (although it should be noted that the research team provided the laptop computer that CBM training was administered). One 'bottleneck' in access was highlighted in India, as half of the training modules involved reading scenarios, many participants had to be excluded because of poor literacy rates. To ensure greater access of such psychological interventions to young people who may have been deprived of education, future studies could consider audio or image-based scenarios (or mental imagery) as an alternative to written scenarios to increase eligibility. This was consistent with feedback given by young people who suggested changes to the delivery format of the training tasks including the interface (improving visuals over reading). Indeed, previous CBM-I studies in adults have utilised audio recordings to supplement written text and mental imagery to simulate personally-salient and relevant situations (Hirsch et al. 2020).

In terms of acceptability, average ratings across indices were "moderate" for participants in the active intervention condition. The majority of participants in the active intervention condition (19 in Nepal, 16 in India) also rated themselves as being moderately or highly motivated to complete the training. Notably, compared to their anticipated motivation levels in completing the intervention with a researcher, this was less apparent when asked to consider self-administration. While there is a trend for remote delivery of interventions to increase access (particularly during the COVID-19 pandemic)

and capitalise on the widespread availability of computerized equipment and internet access, this may not be a viable strategy for engaging those who struggle with motivation or are "digitally poor". Indeed, in some of the open feedback for improvements, young people suggested more traditional forms of treatment delivery, such as group activities or more face-to-face guidance and demonstration by (an adult) researcher. Finally, it is notable that none of the participants reported any unwanted side effects of the training programme suggesting that it is likely to be safe and well-tolerated for the target population.

A secondary objective was to explore effect sizes of post-intervention between-group differences on the hypothesised intervention targets (attention bias and interpretation bias) and a range of emotional but also behavioural and social problem behaviours. For the interpretation measures, between-group differences across both recruitment sites were in the expected direction: those receiving CBM endorsed negative interpretations of ambiguous situations less and benign interpretations of ambiguous situations more than those receiving the control intervention (but effects tended to be small). For attention bias measures, in India participants, those in the CBM group appeared slower at locating negative faces but quicker at locating positive faces than control participants after training. These effects tentatively point to changes in the hypothesised intervention target but as these between-group differences were no supported by the Nepalese participants, they could indicate failure of the visual search training task to (consistently) alter attention biases for threat. These data stand in contrast to more consistent findings demonstrated in young people with a range of anxiety problems in high-income countries (De Voogd et al., 2014; De Voogd et al., 2017; De Voogd et al., 2016; Waters et al. 2015; Waters et al., 2016; Waters et al., 2019). Furthermore, between-group effects did not characterise symptom scores. Some have suggested that weak clinical effects could be due to a period of time or a stressor required for consolidating these cognitive changes or precipitating their effects (e.g. Klein et al. 2018). However, in the absence of convincing effects on targeted factors (i.e. attention, interpretation biases), it may be that a closer look at innovating training tasks is needed. In the adult anxiety and depression literature, a second generation of technology-enhanced eye-tracking paradigms for modifying attention and mental imagery-boosted

interpretation bias modification training are yielding more promising effects (Lazarov, Pine & Bar-Haim, 2017; Hirsch et al., 2020).

Affective disorders arising in the aftermath of childhood victimisation can be more difficult to treat (Nanni, Uher, and Danese 2012) and there are many advantages to delivering early mechanism-based interventions to these young people. Our preliminary data gathered from economically-marginalised young people from Nepal and India suggest that embedding CBM within the structures and resources of care-homes could be feasible. There were considerable differences in the sample composition of the Nepal and India participants. Notably, the sample from India were exclusively male, did not report sexual victimisation, and had somewhat lower IQ scores and literacy rates. While these differences could contribute to between-country differences on the effectiveness of training on symptom reduction, on the primary outcomes reported in this study (feasibility, acceptability), there were remarkable similarities in findings across sites, speaking to the potential generalisability of our intervention programme. However, to make the interface more attractive and available to young people (as well as more efficacious), alternative modes and methods of presenting the training materials need to be considered.

For the next phase of intervention development, we suggest innovations that arise at the intersect of cognitive science and co-design to ensure efficacy but also acceptability. There are several ways in which young people can input into developing the intervention and the protocol. One important way is to select training materials that are meaningful and relevant to their experiences. For example, the face emotion stimuli used here were static faces displaying somewhat artificial expressions. They were also of adult actors – a decision that was made largely because of prior data showing its' face validity in young people and in one of our two cultural groups (young adults in India), as well as the presence of ratings to guide judgements about which stimuli to use and the availability of an ethnically diverse set of faces. Nonetheless, these faces may not be as ecologically valid for a sample of former child labourers in India and Nepal; thus, the development of more realistic stimuli for this cohort could help to boost training effects. Similarly, the hypothetical scenarios used in the CBM-I modules could also be designed with the involvement of lived experience young people to increase their relevance and thus, boosting learning effects during CBM-I

training. This could also involve considering other domains of situations (not just bodily threat and social evaluation) that are relevant to childhood maltreatment. Also considering the next phase of intervention development, it is worth considering the dosing of CBM training sessions both scientifically but also pragmatically given that "real-world" settings that such interventions are being delivered. While the "optimal" number of training sessions remains unclear, we took a somewhat pragmatic approach to determining the number of sessions and the overall length of each session. Conducting 5 CBM training sessions flexibly across 2 weeks with each session lasting no more than 20 minutes was a decision we made with relevant stakeholders in two of our previous protocols – which either administered CBM training to young people with social anxiety in mainstream schools (Lisk et al., 2018) or to young people who had a history of victimisation attending alternate education provision units in the UK and in care-homes in Nepal (Lau et al., 2019). These studies demonstrated acceptability of these timing parameters, especially given that CBM training sessions had to be managed around compulsory lessons and/or or extracurricular routines. Despite this pragmatic approach to intervention delivery, a more systematic approach to evaluating how many sessions and how long these sessions need to be should be encouraged in future research studies to maximise modification of the target mechanisms and symptom reductions.

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References

Baker, H. M., Barry, T. J., Kumari, V., Pandey, R., Shanta, N., & Lau, J. Y. F. (2018). Problematic attention processing and fear learning in adolescent anxiety: Testing a combined cognitive and learning processes model. *Journal of Behavior Therapy and Experimental Psychiatry*, *62*, 146-153.

Beecham, J. (2014). Annual research review: child and adolescent mental health interventions: a review of progress in economic studies across different disorders. *Journal of Child Psychology and Psychiatry*, *55*(6), 714-732.

Biagianti, B., Conelea, C., Brambilla, P., & Bernstein, G. (2020). A systematic review of treatments targeting cognitive biases in socially anxious adolescents: Special Section on "Translational and Neuroscience Studies in Affective Disorders" Section Editor, Maria Nobile MD, PhD. *Journal of Affective Disorders*, *264*, 543-551.

Birmaher, B., Khetarpal, S., Brent, D., Cully, M., Balach, L., Kaufman, J., & Neer, S. M. (1997). The screen for child anxiety related emotional disorders (SCARED): Scale construction and psychometric characteristics. *Journal of the American Academy of Child & Adolescent Psychiatry*, *36*(4), 545-553.

Briggs-Gowan, M. J., Pollak, S. D., Grasso, D., Voss, J., Mian, N. D., Zobel, E., ... & Pine, D. S. (2015). Attention bias and anxiety in young children exposed to family violence. *Journal of child psychology and psychiatry*, *56*(11), 1194-1201.

Cardi, V., Leppanen, J., & Treasure, J. (2015). The effects of negative and positive mood induction on eating behaviour: A meta-analysis of laboratory studies in the healthy population and eating and weight disorders. *Neuroscience and Biobehavioral Reviews*. https://doi.org/10.1016/j.neubiorev.2015.08.011

Cardi, V., Esposito, M., Bird, G., Rhind, C., Yiend, J., Schifano, S., ... & Treasure, J. (2015). A preliminary investigation of a novel training to target cognitive biases towards negative social stimuli in Anorexia Nervosa. *Journal of Affective Disorders*, *188*, 188-193.

Carr, A., Duff, H., & Craddock, F. (2018). A systematic review of reviews of the outcome of noninstitutional child maltreatment. *Trauma, Violence, & Abuse*, *21*(4), 828-843. doi:10.1177/1524838018777788

Cecil, C. A., Viding, E., Fearon, P., Glaser, D., & McCrory, E. J. (2017). Disentangling the mental health impact of childhood abuse and neglect. *Child abuse & neglect*, *63*, 106-119.

Chorozoglou, M., Smith, E., Koerting, J., Thompson, M. J., Sayal, K., & Sonuga-Barke, E. J. (2015). Preschool hyperactivity is associated with long-term economic burden: evidence from a longitudinal health economic analysis of costs incurred across childhood, adolescence and young adulthood. *Journal of Child Psychology and Psychiatry*, *56*(9), 966-975.

Cicchetti, D., & Curtis, W. J. (2005). An event-related potential study of the processing of affective facial expressions in young children who experienced maltreatment during the first year of life. *Development and psychopathology*, *17*(3), 641-677.

Cristea, I. A., Mogoașe, C., David, D., & Cuijpers, P. (2015). Practitioner review: Cognitive bias modification for mental health problems in children and adolescents: A meta-analysis. *Journal of Child Psychology and Psychiatry*, *56*(7), 723-734.

De Voogd, E.L., Wiers, R.W., Prins, P.J. & Salemink, E. (2014). Visual search attentional bias modification reduced social phobia in adolescents. *Journal of Behavioural Therapy and Experimental Psychiatry*, 45(2), 252-9. doi: 10.1016/j.jbtep.2013.11.006.

De Voogd, E.L. et al, (2016). Online attentional bias modification training targeting anxiety and depression in unselected adolescents: Short- and long-term effects of a randomized controlled trial. Behaviour Research and Therapy, 87, 11-22. doi: 10.1016/j.brat.2016.08.018.

De Voogd, E.L., Wiers, R.W., & Salemink, E. (2017). Online visual search attentional bias modification for adolescents with heightened anxiety and depressive symptoms: A randomized controlled trial. *Behaviour Research and Therapy*, 92, 57-67.

Dhakal, S., Niraula, S., Sharma, N. P., Sthapit, S., Bennett, E., Vaswani, A., ... & Lau, J. Y. (2019). History of abuse and neglect and their associations with mental health in rescued child labourers in Nepal. *Australian & New Zealand Journal of Psychiatry*, *53*(12), 1199-1207.

Doshi, J. A., Hodgkins, P., Kahle, J., Sikirica, V., Cangelosi, M. J., Setyawan, J., ... & Neumann, P. J. (2012). Economic impact of childhood and adult attention-deficit/hyperactivity disorder in the United States. *Journal of the American Academy of Child & Adolescent Psychiatry*, *51*(10), 990-1002.

Finkelhor, D., Hamby, S. L., Ormrod, R., & Turner, H. (2005). The Juvenile Victimization Questionnaire: reliability, validity, and national norms. *Child abuse & neglect*, *29*(4), 383-412.

Gadow, K. D., Sprafkin, J., Carlson, G. A., Schneider, J., Nolan, E. E., Mattison, R. E., & Rundberg-Rivera, V. (2002). A DSM-IV–referenced, adolescent self-report rating scale. *Journal of the American Academy of Child & Adolescent Psychiatry*, *41*(6), 671-679.

Gibb, B. E., Schofield, C. A., & Coles, M. E. (2009). Reported history of childhood abuse and young adults' information-processing biases for facial displays of emotion. *Child maltreatment*, *14*(2), 148-156.

Goodman, R. (1997). The Strengths and Difficulties Questionnaire: a research note. *Journal of child psychology and psychiatry*, *38*(5), 581-586.

Gray, P., Baker, H. M., Scerif, G., & Lau, J. Y. (2016). Early maltreatment effects on adolescent attention control to non-emotional and emotional distractors. *Australian journal of psychology*, *68*(3), 143-153.

Gusler, S., & Jackson, Y. (2017). The role of poly-victimization in predicting differences in foster youths' appraisals. *Child Abuse & Neglect*, *69*, 223-231.

Hirsch, C. R., Krahé, C., Whyte, J., Bridge, L., Loizou, S., Norton, S., & Mathews, A. (2020). Effects of modifying interpretation bias on transdiagnostic repetitive negative thinking. *Journal of consulting and clinical psychology*, *88*(3), 226.

Kay, C. L., & Green, J. M. (2016). Social cognitive deficits and biases in maltreated adolescents in UK out-of-home care: relation to disinhibited attachment disorder and psychopathology. *Development and psychopathology*, *28*(1), 73-83.

Klein, A. M., Salemink, E., de Hullu, E., Houtkamp, E., Papa, M., & van der Molen, M. (2018). Cognitive bias modification reduces social anxiety symptoms in socially anxious adolescents

with mild intellectual disabilities: A randomized controlled trial. *Journal of autism and developmental disorders*, *48*(9), 3116-3126.

Krebs, G., Pile, V., Grant, S., Degli Esposti, M., Montgomery, P., & Lau, J. Y. (2018). Research Review: Cognitive bias modification of interpretations in youth and its effect on anxiety: a meta-analysis. *Journal of Child Psychology and Psychiatry*, *59*(8), 831-844. doi:10.1111/jcpp.12809

Lau, J. Y. (2013). Cognitive bias modification of interpretations: A viable treatment for child and adolescent anxiety?. *Behaviour Research and Therapy*, *51*(10), 614-622.

Lau, J. Y., & Waters, A. M. (2017). Annual Research Review: An expanded account of information-processing mechanisms in risk for child and adolescent anxiety and depression. *Journal of Child Psychology and Psychiatry*, *58*(4), 387-407.

Lau, J. Y., Sharma, N. P., Bennett, E., Dhakal, S., Vaswani, A., Pandey, R., ... & Kumari, V. (2020). Acceptability of a brief training programme targeting attention and interpretation biases for threat in youth with a history of maltreatment. *Behavioural and cognitive psychotherapy*, *48*(3), 370-375.

Lazarov, A., Pine, D.S. & Bar-Haim, Y. (2017). Gaze-Contingent Music Reward Therapy for Social Anxiety Disorder: A Randomized Controlled Trial. American Journal of Psychiatry, 174(7), 649-56.

Lisk, S. C., Pile, V., Haller, S. P., Kumari, V., & Lau, J. Y. (2018). Multisession cognitive bias modification targeting multiple biases in adolescents with elevated social anxiety. *Cognitive therapy and research*, *42*(5), 581-597.

Liu, H., Li, X., Han, B., & Liu, X. (2017). Effects of cognitive bias modification on social anxiety: A meta-analysis. *PloS one*, *12*(4), e0175107.

MacLeod, C. (2012). Cognitive bias modification procedures in the management of mental disorders. *Current Opinion in Psychiatry*, *25*(2), 114-120.

McCrory, E. J., & Viding, E. (2015). The theory of latent vulnerability: Reconceptualizing the link between childhood maltreatment and psychiatric disorder. *Development and psychopathology*, *27*(2), 493-505.

Mogg, K., Waters, A. M., & Bradley, B. P. (2017). Attention bias modification (ABM): Review of effects of multisession ABM training on anxiety and threat-related attention in high-anxious individuals. *Clinical Psychological Science*, *5*(4), 698-717.

Nanni, V., Uher, R., & Danese, A. (2012). Childhood maltreatment predicts unfavorable course of illness and treatment outcome in depression: a meta-analysis. *American Journal of Psychiatry*, *169*(2), 141-151.

Pandey, R., Gupta, S., Upadhyay, A., Gupta, R. P., Shukla, M., Mishra, R. C., ... & Kumari, V. (2020). Childhood maltreatment and its mental health consequences among Indian adolescents with a history of child work. *Australian & New Zealand Journal of Psychiatry*, *54*(5), 496-508.

Pollak, S. D. (2012). The role of parenting in the emergence of human emotion: New approaches to the old nature-nurture debate. *Parenting*, *12*(2-3), 232-242.

Pollak, S. D., Cicchetti, D., Hornung, K., & Reed, A. (2000). Recognizing emotion in faces: developmental effects of child abuse and neglect. *Developmental psychology*, *36*(5), 679.

Pollak, S. D., Cicchetti, D., Klorman, R., & Brumaghim, J. T. (1997). Cognitive brain event-related potentials and emotion processing in maltreated children. *Child Development*, 773-787.

Richey, A., Brown, S., Fite, P. J., & Bortolato, M. (2016). The role of hostile attributions in the associations between child maltreatment and reactive and proactive aggression. *Journal of aggression, maltreatment & trauma*, *25*(10), 1043-1057.

Romeo, R., Byford, S., & Knapp, M. (2005). Annotation: Economic evaluations of child and adolescent mental health interventions: a systematic review. *Journal of Child Psychology and Psychiatry*, *46*(9), 919-930.

Shackman, J. E., Shackman, A. J., & Pollak, S. D. (2007). Physical abuse amplifies attention to threat and increases anxiety in children. *Emotion*, *7*(4), 838.

Shahinfar, A., Fox, N. A., & Leavitt, L. A. (2000). Preschool children's exposure to violence: Relation of behavior problems to parent and child reports. *American Journal of Orthopsychiatry*, *70*(1), 115-125.

Snell, T., Knapp, M., Healey, A., Guglani, S., Evans-Lacko, S., Fernandez, J. L., ... & Ford, T. (2013). Economic impact of childhood psychiatric disorder on public sector services in Britain: estimates from national survey data. *Journal of child psychology and psychiatry*, *54*(9), 977-985.

Tottenham, N., Tanaka, J. W., Leon, A. C., McCarry, T., Nurse, M., Hare, T. A., ... & Nelson, C. (2009). The NimStim set of facial expressions: judgments from untrained research participants. *Psychiatry research*, *168*(3), 242-249.

Waters, A.M., Pittaway, M., Mogg, K., Bradley, B.P. & Pine, D.S. (2013). Attention training towards positive stimuli in clinically anxious children. Developmental Cognitive Neuroscience, 4, 77-84. doi: 10.1016/j.dcn.2012.09.004.

Waters, A. M., Zimmer-Gembeck, M. J., Craske, M. G., Pine, D. S., Bradley, B. P., & Mogg, K. (2015). Look for good and never give up: A novel attention training treatment for childhood anxiety disorders. *Behaviour research and therapy*, *73*, 111-123.

Waters, A.M., Zimmer-Gembeck, M.J., Craske, M.G., Pine, D.S., Bradley, B.P. & Mogg, K. (2016). A Preliminary Evaluation of a Home-based, Computer-delivered Attention Training Treatment for Anxious Children Living in Regional Communities. *Journal of Experimental Psychopathology*, 7(3), 511-527. doi:10.5127/jep.053315

Wechsler, D. (2011). Wechsler Abbreviated Scale of Intelligence Second Edition (WASI-II) San Antonio. *TX: Pearson.*

Wiers, R. W., Houben, K., Fadardi, J. S., Van Beek, P., Rhemtulla, M., & Cox, W. M. (2015). Alcohol cognitive bias modification training for problem drinkers over the web. *Addictive behaviors*, *40*, 21-26.

Table 1: Demographic and victimisation experiences in Nepalese and Indian participants.

	Nepal			**India**		
	CBM intervention group n (%) (n=22)	Control intervention group n (%) (n=18)	**Total N** (%) (N=40)	CBM intervention group n (%) (n=18)	Control intervention group n (%) (n=18)	**Total N** (%) (N=36)
Gender						
Male	9 (40.90)	8 (44.44)	17 (42.5)	18 (100)	18 (100)	36 (100)
Female	13 (59.09)	10 (55.55)	23 (57.5)	0	0	0
Mean age (SD)	15.08(1.20)	14.97(1.11)	15.03(1.16)	15.17 (1.21)	15.11 (1.08)	15.14 (1.13)
Maltreatment history						
Physical Abuse	22 (100)	18 (100)	40 (100)	18 (100)	18 (100)	36 (100)
Emotional Abuse	4 (18.2)	6 (33.3)	10 (25)	5 (27.78)	9 (50)	14 (38.89)
Neglect	4 (18.2)	3 (16.7)	7 (17.5)	4 (22.22)	2 (11.11)	6 (16.67)
Witnessed domestic violence	5 (22.7)	2 (11.1)	7 (17.5)	14 (77.78)	13 (72.22)	27 (75)
Witnessed community violence	22 (100)	17 (94.4)	39 (97.5)	17 (94.44)	18 (100)	35 (97.22)
Custodial interference	2(9.1)	1(5.6)	3(7.5)	1 (5.56)	1 (5.56)	2 (5.56)
Sexual assault	2(9.1)	2(11.1)	4(10)	0	0	0

Table 2: Questionnaire data on the acceptability of the interventions

	Nepal		India	
	Intervention	Control	Intervention	Control
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
Mean acceptability ratings across items	3.04 (0.40)	2.87 (0.21)	3.08 (0.44)	2.95 (0.33)
Did you find the training useful?	3.18 (0.59)	3.33 (0.49)	3.39 (0.78)	3.28 (0.83)
To what extent has the training helped you with your worries or anxieties?	2.77 (0.69)	2.33 (0.59)	2.83 (1.04)	2.33 (0.84)
To what extent has the training helped your mood?	2.95 (0.65)	2.67 (0.77)	2.67 (0.91)	2.50 (0.92)
To what extent has the training helped you cope with everyday stressful situations?	2.86 (0.56)	2.89 (0.68)	2.72 (0.83)	2.28 (1.23)
Has the training helped you with any other difficulties you might have had e.g. concentration, sleep etc?	3.05 (0.49)	2.78 (0.65)	2.78 (0.81)	2.72 (0.75)
In an overall general sense, how satisfied are you with the training?	3.09 (0.53)	3.22 (0.65)	3.28 (0.46)	3.06 (0.80)
How satisfied are you with the number of sessions in the training?	3.00 (0.62)	2.89 (0.58)	3.17 (0.79)	3.06 (0.80)
Did you find the training fun or engaging?	3.32 (0.48)	3.06 (0.73)	3.56 (0.78)	3.56 (0.62)

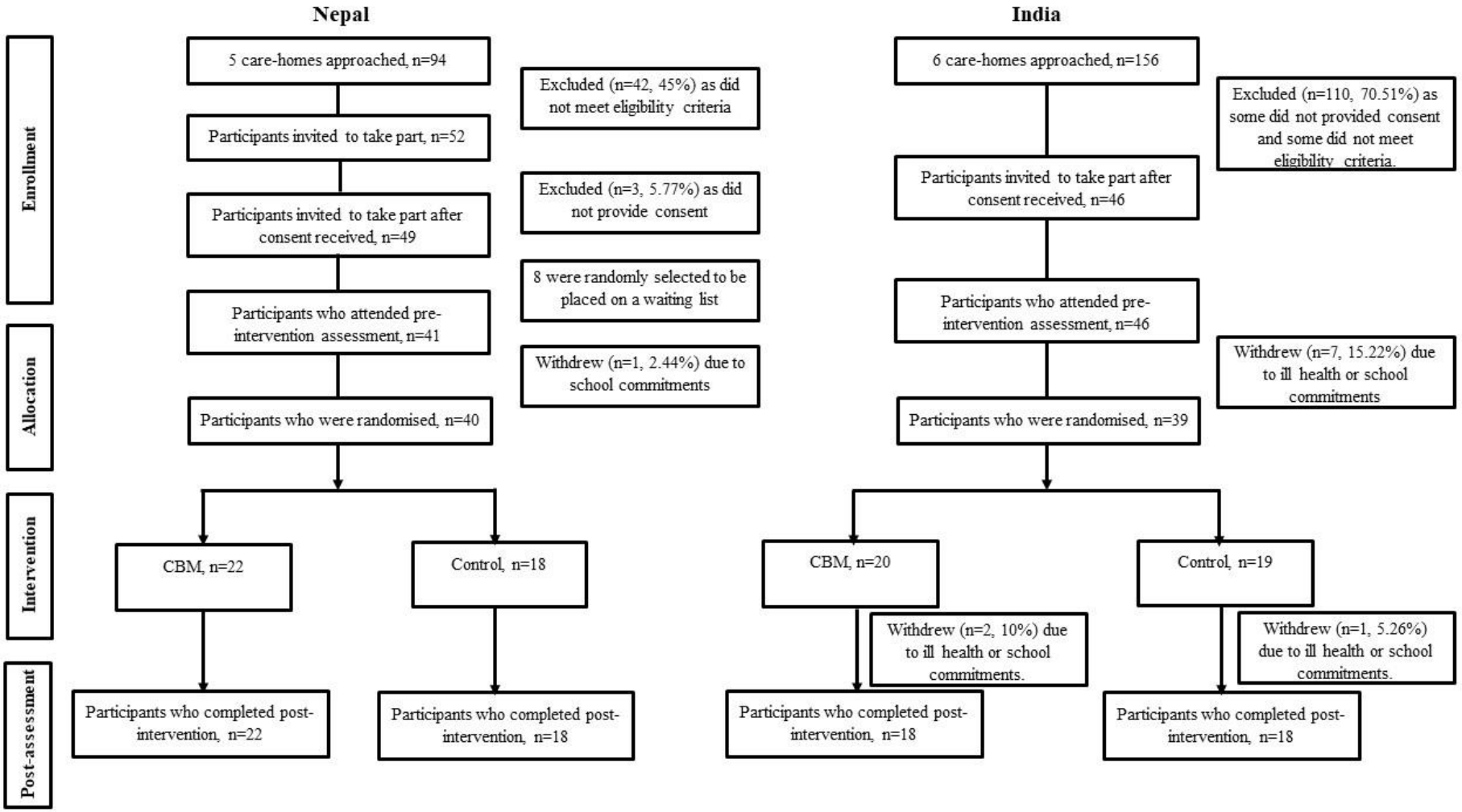
How realistic did you find the situations you were presented with?	3.27 (0.63)	2.89 (0.47)	2.89 (0.47)	2.94 (0.94)
Did you feel motivated to complete each session?	3.18 (0.66)	3.06 (0.73)	3.56 (0.70)	3.56 (0.70)
If the training had been available online, do you think you would have completed each session in your own time (without a researcher)?	2.73 (1.08)	2.50 (0.92)	3.06 (1.11)	3.17 (1.15)
Open-ended questions				
Liked/helpful aspects	"Face game", "finding laughing faces" "Reading scenarios"			
Disliked/unhelpful aspects	"Too much reading" (in the scenarios task)			
Areas of improvement	"Including more games" "Making it (the training) more visually appealing with cartoons " "Making it (the training) a group activity" "Adding feedback in the reading-based task" More guidance to the training "there should be one day of demonstration of training session by the researcher with the administration of the task for the participants from the next day"			

Table 3: Pre-Post intervention cognitive and symptom measures for Nepal and India participants with between group mean differences

Measure	Nepal					India				
	Pre		Post		Between Group Effects	Pre		Post		Between Group Effects
	CBM Mean (SD)	Control Mean (SD)	CBM Mean (SD)	Control Mean (SD)	Cohen's d with [95% confidence interval]	CBM Mean (SD)	Control Mean (SD)	CBM Mean (SD)	Control Mean (SD)	Cohen's d with [95% confidence interval]
Interpretation Bias Task										
Overall negative interpretations	2.60 (0.65)	2.76 (0.50)	2.36 (0.68)	2.66 (0.48)	0.35 [-0.20 to 0.90]	2.95 (0.62)	2.72 (0.54)	2.52 (0.46)	2.53 (0.59)	0.20 [-0.36 to 0.76]
Overall benign interpretations	3.26 (0.4)	3.25 (0.31)	3.59 (0.92)	3.48 (0.45)	-0.15 [-0.79 to 0.49]	3.05 (0.66)	3.16 (0.52)	3.52 (0.78)	3.40 (0.53)	-0.27 [-1.01 to 0.48]
Emotional Visual Search Task										
RT Negative (ms)	4643.91 (1010.89)	5335.60 (1651.98)	3570.63 (1557.13)	3713.39 (990.00)	0.0002	5230.36 (1995.00)	5021.91 (1420.23)	6226.05 (2387.96)	3632.19 (791.61)	**-1.44 [-2.05 to -0.82]**
RT Positive (ms)	5472.137(2258.203)	4976.48 (1359.87)	4474.842(2425.311)	4154.83 (1038.39)	-0.002	6426.33 (1482.28)	5445.65 (1258.88)	3184.31 (705.84)	4401.73 (1363.17)	**1.16 [0.65 to 1.67]**
Screen for Childhood Anxiety Related Emotional Disorders (SCARED)										
General Anxiety	7.41(3.75)	8.06 (3.77)	6.73(3.25)	8.22 (3.54)	**0.32 [-0.17 to 0.78]**	6.72 (3.66)	9.00 (3.73)	7.22 (3.54)	8.11 (4.47)	-0.13
Social Anxiety	5.36(2.97)	7.22 (3.14)	5.14(2.51)	5.94 (2.58)	-0.06	6.94 (3.42)	8.28 (3.49)	6.22 (2.90)	6.61 (2.40)	0.01

Strength and Difficulties Questionnaire (SDQ)										
Emotional Problems	3.36(1.97)	3.94 (2.18)	3.05(2.26)	3.44 (1.89)	0.03	3.33 (2.57)	4.33 (2.30)	2.67 (2.38)	3.28 (2.63)	-0.06

Figure 1: Flow of participants through each recruitment and trial phase


Nepal
India
Enrollment
Allocation
Intervention
Post-assessment
5 care-homes approached, n=94
Excluded (n=42, 45%) as did not meet eligibility criteria
Participants invited to take part, n=52
Excluded (n=3, 5.77%) as did not provide consent
Participants invited to take part after consent received, n=49
8 were randomly selected to be placed on a waiting list
Participants who attended pre-intervention assessment, n=41
Withdrew (n=1, 2.44%) due to school commitments
Participants who were randomised, n=40
CBM, n=22
Control, n=18
Participants who completed post-intervention, n=22
Participants who completed post-intervention, n=18
6 care-homes approached, n=156
Excluded (n=110, 70.51%) as some did not provided consent and some did not meet eligibility criteria.
Participants invited to take part after consent received, n=46
Participants who attended pre-intervention assessment, n=46
Withdrew (n=7, 15.22%) due to ill health or school commitments
Participants who were randomised, n=39
CBM, n=20
Control, n=19
Withdrew (n=2, 10%) due to ill health or school commitments.
Withdrew (n=1, 5.26%) due to ill health or school commitments.
Participants who completed post-intervention, n=18
Participants who completed post-intervention, n=18