Greater Response Interference to Pain Faces Under Low Perceptual Load Conditions in Adolescents With Impairing Pain: A Role for Poor Attention Control Mechanisms in Pain Disability?

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Abstract: Persistent pain in young people in the community is common, but individuals vary in how much pain impacts daily life. Information-processing accounts of chronic pain partly attribute the fear and avoidance of pain, as well as associated interference, to a set of involuntary biases, including the preferential allocation of attention resources toward potential threats. Far less research has focused on the role of voluntary goal-directed attention control processes, the ability to flexibly direct attention toward and away from threats, in explaining pain-associated interference. Using a visual search task, we explored a poor attention control account of pain interference in young people with persistent pain from the community. One hundred and forty five young people aged 16 to 19 years were categorized into three groups: non-chronic pain (n = 68), low-interfering persistent pain (n = 40), and moderate- to high-interfering persistent pain (n = 22). We found that only adolescents with moderate- to high-interfering persistent pain but not the other two groups of adolescents were affected by a search task preceded by a pain face (compared to a neutral face), but this within-group difference emerged only under low perceptual load conditions. Because low perceptual load conditions are thought to require more strategic attention resources to suppress the interfering effects of pain face primes, our findings are consistent with a poor attention control account of pain interference in young people. Analyses further showed that these differences in task performance were not explained by confounding effects of anxiety. If replicated, these findings may have implications for understanding and managing the pain-associated disability in adolescents with chronic pain. 

Perspective: Young people with moderately and highly interfering pain responded slower on an easy search task after seeing a pain face than after seeing a neutral face. If replicated, these findings could mean that boosting the ability to control attention toward and away from threatening cues is an effective strategy for managing interference from pain.

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Key words: Attention control, adolescent pain, interference, cognitive model.
Chronic pain is common in young people. Some adolescents with pain experience significant interruptions to functioning. However, there are few interventions that effectively reduce pain-linked disability. A better understanding of the factors that influence disability within adolescent chronic pain could inform treatment innovation. Information-processing accounts of chronic pain, which attribute fear and avoidance and disability to biases in early threat classification, could provide this understanding.

Indirect support for attention-processing models of pain comes from research demonstrating an increased allocation of attention resources toward bodily “threats,” particularly in adults with chronic pain. Such biased attention patterns may emerge through involuntary bottom-up mechanisms that orient and evaluate the threatening value of stimuli and voluntary top-down inhibitory control mechanisms that serve to suppress attention to threatening stimuli when these are irrelevant and interfere with a primary goal. Both these involuntary and voluntary components of selective attention have been used to explain anxiety, which co-occurs commonly in adolescent chronic pain. Notably, anxious youths show not only increased attention orienting for threat but also weak attention control. In youths with pain, evidence for biased attention orienting for threat is mixed. Fewer studies have measured attention control, with conflicting findings. One study of 16- to 18-year-olds showed that poor attention control exacerbated attention-orienting biases for threat in those with high pain catastrophizing. The same association was not found in a sample of younger adolescents, aged 8 to 17 years, possibly because attention control matures only in late adolescence. Neither study investigated whether this attention-inhibitory process associated with pain disability.

This study assessed whether poor attentional control characterizes young people with persistent interfering levels of pain. We used an emotion-priming visual search task to assess hypotheses around the ability of adolescents with no or low pain and those with high- and low-interfering pain to maintain goal-directed attention when confronted with primes symbolizing pain. As pain-relevant stimuli attract attention, we expected all adolescents to show greater difficulties in maintaining goal-oriented attention following pain-relevant primes than following neutral primes. However, we predicted these difficulties to be exaggerated in adolescents with high-interfering pain, compared with participants with nonchronic pain and those whose pain produces little interference. We further explored these expected pain-related differences as a function of perceptual load. Perceptual load manipulations can affect processing capacity for pain-relevant distractors; therefore, this can influence the engagement of attentional control mechanisms necessary to maintain goal-directed behavior. Because low perceptual load conditions are less taxing, greater interference from pain-relevant primes would be expected, amplifying individual differences in attentional control. Therefore, those with high-interfering pain were hypothesized to show poorer task performance on trials containing pain-relevant primes (than trials containing neutral primes) during low perceptual load conditions. Because high accuracy rates have been found on this visual search task, we examined differences in reaction time. Earlier findings showed the effects of attention control in relation to pain catastrophizing in 16- to 18-year-olds; therefore, we also examined these questions in older adolescents. To assess the specificity of these findings to pain, anxiety was controlled for in these analyses.

Materials and Methods

Sample

In total, 243 participants aged 16 to 19 years were recruited to a study of pain experiences in the community from 5 schools in London. However, the current study reports on data from the visual search task of only 145 of these young people (see Fig 1 for details of data attrition). Technical difficulties in 1 of the 5 schools meant that 41 participants were not able to complete the visual search task, leaving only 202 participants with data on this task. Of these 202 participants, 57 did not have enough “valid” trials after a process of data cleaning (ie, removing trials with missing data, inaccurate responses, or responses that were too fast or too slow relative to that particular participant). Therefore, demographic characteristics, pain group allocation, and subsequent task performance are reported only for these 145 young people (Table 1). Of note, these 145 young people did not differ from the initial 243 participants on any demographic characteristic or in pain group (all P values > .05). Many young people were unable to or preferred not to report on household income; of those who did, 12.4% reported incomes of <£20,000, 13.8% reported incomes between £20,000 and £40,000, 5.5% reported incomes between £40,000 and £60,000, 5.1% reported incomes between £60,000 and £100,000, and 9% reported incomes >£100,000.

Pain group was determined using self-reported items taken from a measure used previously to quantify the severity of pain. The primary outcome of interest was evidence of biased attention orienting toward pain primes. As this measure was expected to reveal group differences, we focused on excluding potential confounds. To this end, we controlled for anxiety, pain catastrophizing, and pain-related disability.

Sample Attrition

Sample attrition varied according to data collected with the visual search task. Specifically, in the initial 243 participants, 241 completed the visual search task (99.2% retention). In total, 202 participants had data on this task. Of these 202 participants, 57 did not have enough “valid” trials after a process of data cleaning (ie, removing trials with missing data, inaccurate responses, or responses that were too fast or too slow relative to that particular participant). Therefore, 145 young people (Table 1) had data on this visual search task. Of note, these 145 young people did not differ from the initial 243 participants on any demographic characteristic or in pain group (all P values > .05). Many young people were unable to or preferred not to report on household income; of those who did, 12.4% reported incomes of <£20,000, 13.8% reported incomes between £20,000 and £40,000, 5.5% reported incomes between £40,000 and £60,000, 5.1% reported incomes between £60,000 and £100,000, and 9% reported incomes >£100,000.

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Recruited N=243

Completed the visual search task N=202

At least 75% valid trials on task N=145

Figure 1. Summary of data attrition across participants.
presence of pain experiences and their impact on daily life among young people in the community. Participants were allocated to the nonchronic pain comparison group (n = 68) if they responded "no" to the item "Have you been feeling any pains for longer than 3 months?" and if they experienced pain less than once a week in response to the item "How often have you felt aches or pains in the last 3 months?" Because we were interested in the role of attention control in explaining variation in the impact of pain rather than pain intensity, we identified adolescents with pain but with no or low interference to daily life (n = 40) as those who responded "yes" to the item "Have you been feeling any pains for longer than 3 months?" but who gave a rating between 1 and 4 (of 10) when asked "How much has pain interfered with you doing activities that other people your age do, in the last 3 months?" Finally, adolescents with pain and with moderate to high levels of interference (n = 22) were defined as those who responded "yes" to the item "Have you been feeling any pains for longer than 3 months?" but who gave a rating between 5 and 10 (of 10) when asked "How much has pain interfered with you doing activities that other people your age do, in the last 3 months?". To confirm the validity of these categories, we sought to assess whether there were significant differences between the 3 groups on other indices of pain, for example, average levels of pain over the last 4 weeks, \( F_{2,100} = 23.79, P < .001 \); average levels of pain over the last 3 months, \( F_{2,100} = 28.48, P < .001 \); the intensity of the most amount of pain experienced, \( F_{2,128} = 18.84, P < .001 \); and pain effects on missing school \( F_{2,124} = 5.27, P < .01 \) (pair-wise comparisons.

### Emotion-Priming Visual Search Task

The current task (Fig 2) was a conjunction visual search task, in which participants were instructed to identify a target among arrays of distractors, after the presentation of a face prime displaying pain or neutral emotion or a nonface scrambled control stimulus. Each trial started with a fixation cross (500 ms), followed by the face (pain or neutral) or nonface (scrambled) stimulus (300 ms). Images of 4 male and 4 female actors displaying pain or neutral expressions were selected from a standardized database; the actors were presented in a random order across trials across participants. The pictures depicting the faces were all presented at a size of 2.9 \( \times \) 4.2 inches and centered on the computer screen, so that the nose of the stimulus replaced the previously presented crosshair. All faces were grayscale cropped to fit within a 2.9 \( \times \) 4.2 inches oval, thus controlling for variations in color. The scrambled face used was a picture of a female actor presenting a neutral face, divided into various small squares changing position, so that the face appeared scrambled. Moreover, these faces never overlapped with the locations of any of the visual search targets (targets were, on average, approximately 1.65 inches from the nearest edge of the face oval). This was to ensure that no target location was inhibited or primed by prior visual stimuli. Consistent with prior studies, there was another fixation for a 600-ms duration between the face prime and the onset of the visual search. This was to allow for disengagement from the face prime stimuli before the visual search. A visual search array, including a target and distractors, was then presented for 2000 ms. The
target was a slanted black bar embedded among white vertical bars, white slanted bars, and black vertical bars. Participants had to find this target and indicate the direction in which it is slanted (left or right), via the keyboard, to record accuracy and response time (RT). If the participant failed to make a response in this time or pressed a key that was not the left or right arrow key, this was recorded as missing for both accuracy and RT. In addition to varying in face emotion, trials also differed in perceptual load, based on the number of distractors present in the array, with 1 distractor (low load), 4 distractors (intermediate load), or 29 distractors (high load). There were 20 trials of each face emotion (pain, neutral, and nonface control) by distractor number (low, intermediate, and high) condition, with 180 trials in total. E-Prime software (Psychology Software Tools, Inc, Sharpsburg, PA) created a random order of trials per each participant, so that no 2 participants saw the same presentation of trials.

We adapted the current task from that of Haas et al,11 who presented face primes displaying anger, fear, happy, surprise, or neutral expressions, or those that were scrambled, to adults with high and low social anxiety, under 4 perceptual load conditions (0 distractors, 4 distractors, 14 distractors, and 29 distractors). Timings for the presentation of the different events in the Haas study were the same as those reported here and were based on an earlier visual search task designed by Becker,1 which was designed to assess whether fear face primes facilitated search efficiency for nonthreatening objects over neutral and happy face primes in neurotypical adults.

To clean the data, we began with 202 participants who completed this task. A total accuracy score across trials and for each of the 9 trial types was computed. Overall accuracy across the 202 participants was 85% (standard deviation [SD] = 24%), but 16% (n = 32) of individuals had an accuracy of <75% (across trials). Of note, 23 of these individuals came from 1 school. For the analysis of the RT data, we first distinguished “invalid” trials from “valid” trials at the participant level. The trials in which the response was inaccurate or missing or in which the RT fell outside of the mean ± 3 SD for each individual (across trials) were considered “invalid.” Next, across all participants, we removed the trials that were not maximally reliable (ie, internally consistent) for that trial type (pain low load, pain intermediate load, pain high load, neutral low load, neutral intermediate load, and neutral high load), using a confirmatory factor modeling approach in MPlus (Muthén & Muthén) to exclude trials that did not load onto a single factor with other trials.23 More specifically, we specified that all trials would load onto a single factor for each trial type, and in subsequent models, we removed items that had a factor loading of <.40. These removed, for all participants, trials thought to reflect measurement error. Using this approach for pain trials, 2 trials were removed (for all participants) for the low-distractor conditions. For both the intermediate- and high-distractor conditions, no trials were discarded. For neutral trials, again, 2 trials were removed (for all participants) for the low-distractor condition, but none was removed for the intermediate- and high-distractor conditions. For the nonface scrambled trials, no trials were discarded. Overall model fits of the 1-factor

Figure 2. Schematic of visual search task. Each trial begins with a fixation cross (500 ms), followed by a face prime (pain, neutral) or nonface (scrambled) stimulus (300 ms). After this, another fixation of 600-ms duration appears to allow for disengagement from the face prime stimuli before the visual search. A visual search array, including a target and distractors, is then presented for 2,000 ms.
models without removing any trials were adequate: Comparative Fit Index (CFI) values varied from .73 to .96; Tucker Lewis index (TLI) values varied from .70 to .95; and RMSEA varied from .05 to .10. More particularly, for the 2 conditions in which discrepant trials were removed, fit statistics were as follows: for pain low-distractor condition, CFI = .73, TLI = .70, and Root Mean Square Error of Approximation (RMSEA) = .10, whereas for the neutral low-distractor condition, CFI = .80, TLI = .78, and RMSEA = .09. Because the purpose of model fitting was to identify trials that did not cohere with others (to boost the reliability of trials that would subsequently be averaged) rather than for hypothesis testing, no other models were tested. This approach is analogous to removing items from a questionnaire scale based on internal consistency statistics. This left 18 trials for each of the low-distractor conditions and all 20 trials for the other conditions, on which mean RTs were calculated. However, mean RTs for each trial type were calculated only for those participants who had valid data on 75% of these selected trials (at least 13 of the 18 trials on each of the low-distractor conditions and at least 15 on the 20 trials for the remaining conditions); this ensured that there were an adequate number of trials per condition to generate a meaningful average. In the final analysis, this left us with the 145 young people who are reported.

Procedure

Ethical approval for this study was sought from the King’s College London Research Ethics Committee. All testing was conducted during class time at school. After obtaining consent from participants, they were tested simultaneously as a group, with at least 2 experimenters present to ensure that participants were able to ask questions if they did not understand the task and to minimize any conversations between participants during the completion of tasks and questionnaires. After obtaining the informed consent, participants were instructed to complete a demographic form containing information about their date of birth, gender identity, ethnicity group, their first language, and, if known, their parental educational levels and income. Participants then completed the cognitive control task, followed by a questionnaire containing items around pain experiences and the Revised Children’s Anxiety and Depression Scale. Participants were then thanked for their time and e-mailed a £5 gift voucher, together with a summary of the findings around 2 weeks after data collection.

Statistical Analysis

Pain groups were first compared on the nonface scrambled stimuli to ensure that there were no accuracy and RT differences on a baseline condition across groups. Next, we performed $2 \times 3 \times 3$ mixed-design analysis of variance (ANOVA), with face emotion (pain or neutral) and perceptual load (low, intermediate, or high) as within-subject factors and pain group (nonchronic pain, no or low-interfering chronic pain, or moderate- or high-interfering chronic pain) as the between-subject factor on RT. Because our error rates were higher than those reported in previous studies, we also performed an analysis on accuracy. To explore whether any of the pain group differences were driven by anxiety, these analyses were repeated, with anxiety symptoms as a continuous covariate.

Results

No differences were observed between pain groups in terms of age, $F_{2,111} = .31, P = .74$; gender, $\chi^2(2) = 1.39, P = .50$; ethnicity, $\chi^2(10) = 6.81, P = .74$; school attended, $\chi^2(6) = 9.58, P = .14$; or native language, $\chi^2(2) = .81, P = .67$ (Table 1). Mean anxiety t-scores for each of the 3 groups are also presented in Table 1. Significant differences emerged across groups, $F_{2,135} = 8.75, P < .001$, with significant comparisons between the high- and low-interference groups and the nonchronic pain group (both $P$ values < .05) but a nonsignificant difference between the high- and low-pain interference groups ($P = .10$).

Pain Analysis

Scrambled Nonface Primes (RTs and Accuracy)

Analyses performed on RTs and accuracy scores of trials containing the scrambled nonface baseline stimuli showed only a main effect of perceptual load on the RT, $F_{2,272} = 404.40, P < .001$. The fastest RTs were observed to the condition with the fewest number of distractors, followed by the intermediate number of distractors, and the slowest RTs to the high load (all pairwise $P$ values < .001). There were no significant effects predicting accuracy and no effects of group on RT or accuracy.

Pain and Neutral Face Primes (RTs)

The $2 \times 3 \times 3$ mixed-design ANOVA performed on RTs of accurate, range-corrected, and internally consistent trials revealed significant main effects of face emotion, $F_{1,254} = 9.34, P = .003$, and perceptual load, $F_{2,254} = 465.05, P < .001$, as well as a significant 2-way interaction between these, $F_{2,254} = 9.57, P < .001$. The 3-way face emotion $\times$ load $\times$ pain interaction was also significant, $F_{4,254} = 2.79, P < .035$. There were neither any 2-way interactions between pain group with face emotion or perceptual load nor a main effect of pain group (all $P$ values $>.57$). Main effects of emotion were driven by longer RTs to pain versus neutral trials, whereas main effects of perceptual load reflected increasing RTs with increasing number of distractors, as described previously (all pair-wise $P$ values < .001). We decomposed the 3-way interaction by investigating emotion and pain group effects on RTs for each perceptual load condition (Fig 3). For the high perceptual load condition, there was only a significant main effect of emotion, $F_{1,135} = 13.74, P < .001$, indicating longer RTs for pain trials than for neutral trials. For the intermediate perceptual load condition, there were neither main
nor interaction effects between the emotion and pain groups (all $P$ values $> .08$). Finally, for the condition with the lowest perceptual load, a significant interaction between the emotion and pain groups emerged, $F_{1,138} = 5.14$, $P = .007$. When each group was examined separately, the face emotion effect was significant only for the moderate- or high-interfering pain participants, $t_{22} = 3.17$, $P < .01$, where slower RTs were found for pain trials than for neutral trials. No pain group differences were significant when examining pain trials and neutral trials separately.

**Pain and Neutral Face Primes (Accuracy)**

Analyses performed on the accuracy scores of the pain and neutral face trials revealed a significant main effect of perceptual load, $F_{1,83,330} = 3.75$, $P = .028$ and a significant interaction between face emotion group and pain group, $F_{2,330} = 3.42$, $P = .035$. All other main effects and interactions were not significant (all $P$ values $> .102$). The main effect of perceptual load was driven by greater accuracy in the condition with the fewest versus the greatest number of distractors, $t_{191} = 2.65$, $P = .009$, but there were nonsignificant differences between the other conditions ($P$ values $> .054$). To unpack the face-emotion-by-pain-group interaction, we first compared accuracy scores of pain trials versus neutral trials (collapsed across perceptual load) in each group separately. The low-interfering pain group performed significantly more accurately on pain trials than on neutral trials, $t_{48} = 2.30$, $P = .026$. The other groups did not vary in accuracy across trial types ($P$ values $> .10$). Unpacking the interaction by comparing groups on accuracy for pain and neutral trials (collapsed across perceptual load) separately, we found no significant group differences on each trial (all $P$ values $> .945$).

**Anxiety Analysis**

All the $2 \times 3 \times 3$ mixed-design ANOVA with pain groups on accuracy and RT data were rerun as analyses of covariance, with anxiety as a continuous covariate. The 2-way interaction between face emotion and perceptual load was no longer significant, whereas the critical 3-way interaction between face emotion, perceptual load, and pain group remained significant ($P = .03$). Breaking this down revealed the crucial 2-way interaction in the low perceptual load condition between pain group and face emotion, suggesting that the pain group differences were not driven by anxiety. In addition, there was no significant main effect of anxiety or interactions between anxiety and other factors (all $P$ values $> .14$).

**Discussion**

The goal of this study was to investigate cognitive factors that could potentially explain variability in the impact of persistent pain on daily functioning. To probe attention control differences among adolescents with varying degrees of interfering pain, we compared the effects of task-irrelevant (pain and neutral) primes on subsequent visual search performance under different levels of perceptual load (task difficulty). Participants generally performed in a way that conformed to task expectations: showing slower RTs and lower accuracy under high perceptual load conditions relative to low perceptual load conditions and slower RTs to trials containing pain primes relative to neutral primes. However, levels of pain-related functioning also predicted task performance. When primed with faces displaying pain emotions, adolescents with persistent pain reporting moderate to high impairment were slower at identifying a target.
among distractors, under low-load task conditions, relative trials that were preceded by a neutral face prime—a pattern that did not characterize the other 2 groups of adolescents. Because faces displaying pain may be more likely to be processed further under low perceptual load conditions, arguably, more attentional resources may be required to suppress their effects during the visual search task. Thus, these findings can be interpreted as being consistent with a weak attentional control account of pain interference in adolescents with more persisting pain in the community. However, a more positive finding was that when task demands increased—that is, under intermediate and high perceptual load conditions, even in adolescents with pain that imposed moderate to high levels of interference—a pain-related prime did not result in modulations in speed (or accuracy) of target detection. Importantly, the same findings associated with pain emerged even after controlling for a continuous measure of anxiety.

Before study implications are discussed, caveats that limit interpretations should be considered. First, the demographic characteristics of this sample constrain the generalizability of these findings. Only young people aged 16 to 19 years were assessed, owing to their availability for testing during school hours. As rates of some chronic pain conditions may increase across adolescence, and as attention control and its neural substrates show protracted maturation across this juncture, different associations between pain, disability, and cognitive control may characterize other ages within adolescence. Future studies should explore these interactions with age. Similarly, our sample was largely composed of female participants, and although we had some male participants, we were still inadequately powered to examine interactions between gender and pain group on task performance across trial type and perceptual load. Related to issues around sample representativeness, it is worth noting that of the study sample administered to this task (n = 202), around 28% of participants’ data were excluded because of high rates of inaccuracy. These participants were mainly from 1 school, with several reasons for the high error rates, including but not limited to inattention owing to group testing conditions, poor comprehension of instructions, and low cognitive ability. Although we did not collect data on school attainments or cognitive ability of participants, it is noteworthy that this school was an underperforming school in a deprived area in London. Future studies should assess visual search performance under individual testing conditions. These exclusions also raise questions over the degree to which these findings generalize to all young people. Second, we did not assess whether young people recognized the pain face expressions as representing pain. To attribute these findings to pain faces, one should ask participants to identify the expressions in a posttask assessment. However, dynamic versions of these facial expressions have been discriminated from faces displaying other face emotions based on the Facial Action Coding System and on volunteer rating data, confirming the distinct configuration and recognition of pain among observers. A separate issue is that we presented participants with only 3 trial types: those containing pain, neutral, or scrambled faces; therefore, the absence of other negative but nonpain faces, such as fear and anger, meant that we could not inform the specificity of our findings to pain. Third, pain group and associated functional interference were determined on a few questions rather than a diagnostic tool to establish chronic pain and/or the use of a more comprehensive questionnaire on the domains of functional interference. Our participants were also recruited through schools, suggesting that interference levels were likely to be far milder than a clinical sample. The work would be augmented if these preliminary findings were extended to patient samples meeting clinical diagnosis for pain chronicity and clinically relevant functional impairment. Finally, recent criticisms of experimental tasks have focused on the lack of consideration for psychometric properties. Although we are yet unsure of the intertime reliability of the present task, a factor modeling approach to exclude trials that did not cohere with other trials in the same condition was used to maximize scale reliability.

Despite these limitations, our findings raise some new considerations for information-processing accounts of interference and potential disability in adolescent pain. As with adults, cognitive models of chronic pain in children and young people attribute fear and avoidance within pain trajectories to biases in the early classification of pain. Becoming increasingly attentive and vigilant toward threats (and interpreting ambiguous cues as threatening) are thought to maintain fear and anxiety and drive avoidance, leading to a vicious cycle of disability and chronic pain. These models have rarely considered whether other more voluntary and strategic processes such as attention control could also play a role in pain-linked interference and disability. Our data provide preliminary support that weaker attention control is associated with functional impairment and potentially disability in adolescent chronic pain. However, these findings cannot shed light on the direction of effects: whether weak attention control precedes pain and influences impairment or whether pain disrupts attention control by depleting processing resources. These findings also do not inform how attention control coacts with more involuntary, automatic attention, and interpretation biases on pain outcomes. It is possible that attention control is an independent factor but is correlated with information-processing biases, perhaps because pain experiences influence both these aspects of cognitive processing. A second possibility is that low attention control interacts with other relevant traits factors, such as pain catastrophizing, to give rise to biased interpretation and attention. Indeed, the data have shown that individuals with low attention control, but also high pain catastrophizing, could be more likely to manifest involuntary biases in attention. These
complex interrelationships will require further empirical verification, but preferably, within studies that also aim to replicate our initial pattern of findings to other independent samples.

Conclusions

Previous approaches to studying variability in pain experiences have tended to confound pain intensity ratings and pain-associated functioning in youths. Here, we investigated cognitive factors in pain-associated functioning by assessing differences between those with persistent pain who reported low versus moderate to high interference. We provide preliminary data testing whether attention control capacities during the presentation of goal-irrelevant pain information are weaker in young people with pain with moderate to high impact. We found that only under low perceptual load conditions, when goal-irrelevant pain primes are more salient and require greater attention control, did subtle group differences emerge. Those with moderate- or high-interfering pain struggled to respond as quickly on a probe search task in trials that contained pain face primes than in trials that contained neutral face primes. These findings did not extend to those with little or no chronic pain symptoms or those with no or low-interfering pain and were also independent of anxiety symptoms. Although future studies should first aim to reproduce our findings by using the current tasks, it is noted that attention control could be measured using different behavioral tasks and possibly other psychophysiological and neural indices of task performance as well. Another finding that also requires further replication is whether under conditions of intermediate and high perceptual load, young people with pain reporting moderate to high levels of functional impairment indeed respond as quickly to a primary task following the presence of a pain prime relative to the presence of a neutral prime. This could have implications for pain management strategies and/or rehabilitation efforts, where the setting of more effortful goals could temporarily allow suppression of irrelevant pain cues.

References


