Assessing the Relationship Between Cold Pressor Pain Responses and Dimensions of the Anxiety Sensitivity Profile in Healthy Men and Women

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Assessing the Relationship Between Cold Pressor Pain Responses and Dimensions of the Anxiety Sensitivity Profile in Healthy Men and Women

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Abstract. Anxiety sensitivity (AS) has been shown previously to be an important factor in the perception and experience of experimentally induced pain within healthy adults. The aim of the current study was to extend this research by: (i) using the Anxiety Sensitivity Profile (ASP) as an alternative measure of AS; (ii) examining whether different coping instructions affect pain reports; and (iii) investigating potential differences between men and women. Participants were 50 healthy adults (23 males, 27 females) who were required to complete 2 versions of the cold pressor pain task; one version required the use of control instructions, whereas the other made use of acceptance-based instructions. Although the coping instructions were found to affect pain thresholds (acceptance resulted in lower thresholds), a similar pattern of correlations were found between the pain indexes and AS under both conditions. Of the ASP subscales, the gastrointestinal and cognitive concerns components were found to be the most strongly related to pain experiences. When the analysis was conducted separately for each sex, the ASP scales were related to the self-report measures of pain in women, whereas they were related to the behavioural measures of pain in men. These results not only confirm that AS is associated with experimental pain, but that there may be sex differences in this relationship. Key words: anxiety sensitivity; pain; panic; sex differences; experimental pain; acceptance; cognitive therapy

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As is apparent from this special issue of Cognitive Behaviour Therapy, there is growing interest in the application of anxiety sensitivity (AS) to the area of pain. Evidence from a range of acute and chronic pain states indicates that AS is related not only to the perception and experience of pain, but also to fear avoidance and disability (Asmundson, Norton, & Norton, 1999; Keogh & Asmundson, 2004). What seems important about AS is that it may serve as a risk factor in the development of pain chronicity (Norton & Asmundson, 2003), as well as play a role in acute pain episodes. For example, 1 study found that AS mediates the relationship between prenatal negative birth expectations and fear experiences during a caesarean section (Keogh, Hughes, Ellery, Daniels, & Holdcroft, 2006). Another study found AS to be related to pain during childbirth (Lang, Sorrell, Rodgers, & Lebeck, 2006). There is also evidence to suggest that prenatal AS predicts subsequent post-traumatic stress symptoms (Keogh, Ayers, & Francis, 2002), which are known to co-occur with acute and chronic pain (Asmundson, Coons, Taylor, & Katz, 2002; Olde, van der Hart, Kleber, & van Son, 2006).

An alternative approach to investigating AS and pain is to examine this relationship in healthy adults, using experimental (i.e. controlled) pain induction techniques (e.g. Jones &
Zachariae, 2004; Keogh & Birkby, 1999; Keogh & Chaloner, 2002; Keogh & Cochrane, 2002; Keogh & Mansoor, 2001; Roelofs, Peters, van der Zijden, & Vlaeyen, 2004; Schmidt & Cook, 1999; see also Conrod, this issue; Tsao et al., this issue). The general pattern seems to be that AS is related to increased pain sensitivity. At least 1 study has also shown that the AS / thermal pain relationship is associated with activation in specific brain regions believed to be related to self-focused attention, i.e. medial prefrontal region (Ochsner et al., 2006). That the fear of pain was related to activation within other regions (ventral lateral frontal region, anterior and posterior cingulate) implies that AS is distinct from other fear constructs.

One pattern that emerges is that more consistent effects are found for self-report pain experiences than for behavioural measures of pain threshold and tolerance (although some studies do occasionally find effects) (for review see Uman et al., this issue). Additionally, the relationship between AS and experimental pain may be stronger in women than men (Keogh & Birkby, 1999). Such sex-specific effects are not limited to the laboratory. For example, within patients referred to a hospital clinic with new episodes of chest pain, we found that women high in AS reported the highest pain levels (Keogh, Hamid, Hamid, & Ellery, 2004). This not only indicates that the AS / pain relationship is moderated by sex, but also highlights the utility of using experimental pain methods, as results found in the laboratory seem to translate to the clinic.

Whilst it seems likely that AS is related to an increased susceptibility to pain, there are a number of unanswered questions. For example, the research conducted to date has depended on 1 measure of AS, the Anxiety Sensitivity Index (ASI; Reiss, Peterson, Gursky, & McNally, 1986). While the ASI is generally considered to be a good, reliable and valid measure, and is the most widely used measure of this construct, 1 test of the generalizability of the AS / pain relationship would be to see whether it is found when using other measures. A measure that has not yet been applied to a pain-induction paradigm, but that may be useful in this context, is the Anxiety Sensitivity Profile (ASP; Olatunji et al., 2005; Taylor & Cox, 1998). Like the ASI, factor analyses of the ASP reveal a number of lower-order subscales. The advantage of the ASP, however, is that it has many more items (60 vs 16) and so allows for a more detailed investigation of the subcomponents of AS. While the ASI consists of 16 items thought to reflect 3 lower-order dimensions (physical, social and mental concerns; Keogh, 2004), the ASP was conceptualized as consisting of 6 dimensions: cardiovascular, respiratory, gastrointestinal, publicly observable anxiety reactions, dissociative and neurological symptoms, and cognitive dyscontrol. To date, most AS / pain research has examined the global AS construct and not examined these subcomponents.

A second question is whether the AS / pain relationship can be modified. This is important because if it is possible to change this relationship, then it may have real practical applications for those susceptible to pain. There have been few specific interventions that aim to change, or at least help people deal with, such AS-related pain (but see Watt et al., this issue, for an exception). One laboratory technique is to provide participants with different coping instructions to see whether they affect the pain reports of those high and low in AS. For example, when we compared focused and distraction type instructions, there was a suggestion that focusing on pain was a benefit for those high in AS (Keogh & Mansoor, 2001).

The utility of varying experimental coping instructions to examine the AS / pain relationship is that it also allows for the comparison of different theoretical approaches to psychological pain management. Since AS is believed to serve as a vulnerability factor to the development of panic disorder, one of the more obvious therapeutic approaches that may be considered appropriate to help those high in AS would be a cognitive-behavioural one, such as the control-based approaches advocated by Beck (Beck, Emery, & Greenberg, 1985; Beck, Rush, Shaw, & Emery, 1979). However, another approach that is emerging as potentially important, both generally within the area of cognitive behaviour therapy, as well as more specifically within the treatment of pain, is an acceptance-based approach (Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Hayes, Strosahl, & Wilson, 1999; McCracken, 2005; McCracken, Carson, Eccleston, & Keefe, 2004). While control-based approaches advocate patients attempting to
change the frequency and content of thoughts and feelings associated with pain and anxiety, these newer approaches suggest adopting a more mindful, acceptance-based attitude in which such thoughts and feelings are not changed, avoided, or used as reasons not to pursue actions that would promote one’s values and goals (e.g. going to work or to the shops). Importantly, within the current context, acceptance type coping instructions have been applied to laboratory-based pain settings, and found to be better at reducing pain experiences than control-based ones (Hayes, et al. 1999; Keogh, Bond, Hammer, & Tilston, 2005). We are unaware of any study that has examined such coping instructions within the context of AS, gender and pain.

The primary aim of this study was to address these issues using an experimental pain induction methodology. Our first objective was to make use of the ASP as our measure of AS, and examine how the various subcomponents relate to pain experiences. Since previous work suggests that there may be sex differences in both pain and AS, a second objective was to examine potential differences between men and women in the relationships between AS and pain. Finally, we also wanted to examine whether different pain coping instructions (control vs acceptance) would differentially affect pain reports. Based on the results of previous studies we predicted that:

- the fear of arousal component of the ASP would be the most strongly related to the pain variables (especially the self-report measures of pain);
- women would show a stronger AS / pain relationship than men; and,
- acceptance-based instructions would be more beneficial than control-based instructions, and that this would be most pronounced within women.

## Method

### Participants

A total of 50 healthy adults were recruited into the study. Inclusion criteria were that they were healthy, over the age of 18 years, and not currently in pain or taking any form of medications, especially analgesics (but excluding oral contraceptives). There were 23 males and 27 females aged between 20 and 56 years (mean age=28.26 years; SD=10.25). Participant characteristics are presented in Table 1 by sex. Independent t-tests revealed that women reported higher DASS stress scores than men. No sex differences were found for anxiety, depression, AS or age.

### Pain induction task

The cold pressor task was the pain induction method employed in the current study. This approach has not only been used to experimentally examine pain sensitivity, but has been the method used within the majority of previous AS studies (Keogh & Asmundson, 2004; see also Tsao et al., this issue; Uman et al., this issue). The task requires participants to place their dominant hand in a warm water bath (37°C) for 2 minutes to establish a baseline. Then the hand is transferred to a

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
<th>t-test</th>
<th>Cohen’s d</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASP</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arousal</td>
<td>60.59 (13.23)</td>
<td>62.60 (16.81)</td>
<td>−0.451</td>
<td>0.133</td>
</tr>
<tr>
<td>Cognitive</td>
<td>28.96 (11.81)</td>
<td>34.89 (13.49)</td>
<td>−1.640</td>
<td>0.468</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>15.68 (5.69)</td>
<td>17.07 (7.72)</td>
<td>−0.704</td>
<td>0.205</td>
</tr>
<tr>
<td>Total</td>
<td>107.14 (22.67)</td>
<td>112.84 (30.54)</td>
<td>−0.706</td>
<td>0.212</td>
</tr>
<tr>
<td>DASS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stress</td>
<td>9.18 (7.16)</td>
<td>15.85 (8.18)</td>
<td>−2.976**</td>
<td>0.868</td>
</tr>
<tr>
<td>Anxiety</td>
<td>4.96 (6.35)</td>
<td>7.48 (7.93)</td>
<td>−1.227</td>
<td>0.351</td>
</tr>
<tr>
<td>Depression</td>
<td>7.04 (6.52)</td>
<td>9.78 (6.89)</td>
<td>−1.433</td>
<td>0.408</td>
</tr>
<tr>
<td>Age (years)</td>
<td>25.86 (4.28)</td>
<td>30.28 (13.13)</td>
<td>−1.477</td>
<td>0.453</td>
</tr>
</tbody>
</table>

**p < 0.01; ASP=Anxiety Sensitivity Profile; DASS=Depression Anxiety Stress Scale.
cold water bath, maintained around 0–2°C. Participants are instructed to indicate the point at which they first detect pain (threshold), and the point at which they can no longer stand the pain and withdraw their hand (tolerance). Pain threshold and tolerance points are both measured in seconds. The task is safe, replicable and perceived to be a good measure of thermal pain sensitivity (Graven-Nielsen, Sergerdahl, Svensson, & Arendt-Nielsen, 2001).

**Coping instructions**

For the current study we employed the same instructions used by Keogh et al. (2005). Specifically, we developed 2 sets of instruction. One set was control-based in that participants were asked to try and control their thoughts and feelings during the pain task, and were broadly based on a Beck-type approach (Beck et al., 1979, 1985). The second set of instructions was acceptance-based, and asked participants to try to notice their thoughts and feelings during the task without actually allowing those internal events to control what they do. The acceptance approach was broadly based on Acceptance and Commitment Therapy (Hayes et al., 1999).

**Questionnaire measures**

*Short form McGill Pain Questionnaire (SF-MPQ).* Pain was assessed using the SF-MPQ (Melzack, 1987). The current study focused on the pain rating scale since this has previously been found to be most consistently related to the AS / pain relationship; the visual analogue scale and present pain index were not utilized here. The pain rating scale consists of 15 descriptor items, of which 11 relate to sensory pain experiences (e.g. throbbing), and 4 to the affective component of pain (e.g. sickening). Each item is rated on a 4-point scale, ranging from none (scored as 0) through to severe (scored as 3), and a total for each scale calculated. The factor structure of the SF-MPQ has been confirmed through confirmatory factor analysis (Wright, Asmundson, & McCreary, 2001), and has been extensively used in experimental and clinical settings (e.g. see Carleton et al., this issue). It is considered both a valid and reliable measure of pain.

*Anxiety Sensitivity Profile (ASP).* AS was assessed using the ASP (Taylor & Cox, 1998). This scale is relatively new and is comprised of 60 items that are scored on a 7-point scale, with 1 indicating “not at all likely” and 7 “extremely likely” that various sensations will lead to something bad. Although originally conceived as a 6 subscale measure, factor analyses indicate that there are 4 main factors, although there are some small discrepancies concerning how items load. We examined the 3 analyses reported by Taylor and Cox (1998) and Olatunji et al. (2005) and identified the items that consistently loaded on the same factor across these studies. These items formed the following 4 scales: (i) fear of arousal-related sensations (items 3, 6, 9, 10, 15, 17, 19, 21, 23, 26, 30, 34, 43, 45, 47, 52, 55, 59, 60), (ii) fear of cognitive dyscontrol and dissociation (items 2, 7, 13, 18, 24, 25, 36, 39, 41, 44, 48, 54, 56), (iii) fear of gastrointestinal symptoms (items 4, 11, 27, 32, 40, 49, 50), and (iv) fear of cardiac symptoms (items 1, 14). Reliability analysis revealed alphas of 0.88, 0.92, 0.81, and 0.65, respectively. This suggests that the majority of scales have generally good reliability, with the only exception being the cardiac symptoms scale. This is similar to the conclusions drawn by Olatunji et al. (2005). Since the cardiac scale of the ASP had low reliability it was excluded from all subsequent analyses.

*Depression Anxiety Stress Scale (DASS).* In order to ascertain whether mood was related to pain, the short-form DASS (Lovibond & Lovibond, 1995) was administered to capture feelings of anxiety and depression. The DASS is comprised of 21 items that are rated on a 4-point scale, with scores ranging from 0 (did not apply to me at all) to 3 (applied to me very much, or most of the time). These items are then summed to produce 3 subscales, all consisting of 7 items, relating to stress, anxiety, and depression, respectively. The DASS has been shown to have good factorial stability and is considered a reliable and valid measure of mood (Antony, Bieling, Cox, Enns, & Swinson, 1998).

**Procedure**

Following screening, consenting adults were provided with cold pressor instructions. They completed a practise cold pressor trial in order to familiarize themselves with the task (data from this practice trial was used in an unrelated study; Keogh, Mounce & Brosnan,
in press). Next participants completed 2 experimental cold pressor tasks, 1 with control-based instructions, and 1 with acceptance-based instructions. The order of task instruction was counterbalanced between participants. After each task, participants were immediately administered the SF-MPQ. In between the cold pressor tasks, participants completed the ASP and DASS. Participants were debriefed following completion of the second experimental task.

**Design and analysis**

A mixed experimental and correlational design was used. For the experimental component, mixed-groups ANCOVA was used. Since there was a significant sex difference on the DASS stress scale, this factor served as a covariate to control for sex-specific differences in stress on any differences in pain between men and women. Therefore, sex (male vs females) served as the between-groups factor, stress as the covariate, and coping instruction (control vs acceptance) as the within-groups factor. The dependent variables were the various pain measures (threshold, tolerance, sensory and affective pain). For the correlational component of the study, AS scores were correlated with the pain measures under the control and acceptance conditions; this was then conducted separately for males and females.

**Results**

**Data screening and descriptive statistics**

All data were subject to screening for skewness using frequency checks. Since the pain data were marginally positively skewed, we transformed these measures using square root transformations (Tabachnick & Fidell, 2001). All subsequent analyses were conducted on the transformed data, although presented means represent the untransformed scores in order to aid interpretability. Means and standard deviations for all pain measures under the different conditions of the experiment are displayed in Table 2.

**Sex differences in pain**

The first set of analyses conducted were a set of mixed-groups ANCOVA's on the 4 pain indexes. For pain threshold, the covariate stress was significant (beta=-0.32; F(1, 45)=4.35, p<0.05) indicating that higher levels of stress were related to lower pain thresholds. A main effect of coping instruction was also found (acceptance=29.79, control=40.49; F(1, 46)=8.25, p<0.01), indicating that the acceptance instructions resulted in a lower pain threshold when compared with the control instructions. For sensory pain, the only significant result found was a main effect for coping instruction (acceptance=10.34, control=9.08; F(1, 48)=6.23, p<0.05), suggesting acceptance resulted in a greater sensitivity to the sensory component of pain. No other significant effects were found.

Since it is possible that coping instruction order played a role, we repeated the analysis including order (control condition first or second) as an additional between-groups factor. Although this did not alter the above mentioned effects, an additional significant interaction was found between sex and order for pain tolerance (F(1, 43)=5.81, p<0.05). Simple effects revealed that when control was used first, women had a lower overall pain tolerance than men (F(1, 44)=9.26, p<0.05). Furthermore, within women, overall pain tolerance was lower when control was used

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
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<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Acceptance</td>
</tr>
<tr>
<td>Threshold</td>
<td>44.29 (36.21)</td>
<td>29.85 (20.08)</td>
</tr>
<tr>
<td>Tolerance</td>
<td>87.08 (35.25)</td>
<td>85.91 (38.43)</td>
</tr>
<tr>
<td>Sensory</td>
<td>8.57 (4.98)</td>
<td>10.04 (7.16)</td>
</tr>
<tr>
<td>Affective</td>
<td>.96 (1.46)</td>
<td>1.22 (2.61)</td>
</tr>
</tbody>
</table>
first than when it was used second \((F(1, 44) = 7.06, p < 0.05)\).

**Correlational analyses**

A series of correlations were conducted between the questionnaire measures and the pain indexes. The first set was conducted separately for the 2 different coping instruction conditions (see Table 3). There were few notable relationships involving pain threshold or tolerance. However, for the self-report measures of sensory and affective pain, there were a number of positive relationships with the cognitive and gastrointestinal ASP scales. Unexpectedly, these relationships were similar across the control and acceptance conditions.

Since there were no noticeable differences in the relationship found between the coping instructions, mean pain ratings were calculated for each index by averaging across the 2 conditions. These average scores were then correlated with the 3 ASP subscales separately for men and women to determine whether there were any sex differences. Since there were sex differences in stress, this variable was partialled out of the correlations. As can be seen in Table 4, for men, but not women, there was a significant negative relationship between the arousal subscale of the ASP and pain threshold and pain tolerance, as well as a significant negative relationship between the cognitive concerns scale and pain tolerance. Within women, however, it seemed as if it was the sensory and affective components of pain that were generally related to the ASP scales (note: for men, there was also a significant relationship between affective pain and the cognitive concerns scale). Together this suggests that there may be a sex-specific difference in the way in which the various components of AS are related to pain. For men, there seems to be a relationship between the fear of arousal-related symptoms and behavioral measures of pain (pain threshold/tolerance), whereas within women it seems as if the fear of gastrointestinal symptoms and cognitive concerns are related to a greater sensitivity to self-reported pain.

**Discussion**

The primary goal of this study was to determine whether AS, as measured using the ASP, was related to the pain ratings of healthy adults following a cold pressor pain challenge. As predicted, AS was related to

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**Table 3.** Correlations between Anxiety Sensitivity Profile scales and pain measures by coping instruction condition (control vs acceptance).

<table>
<thead>
<tr>
<th></th>
<th>Control</th>
<th>Acceptance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Threshold</td>
<td>Tolerance</td>
</tr>
<tr>
<td>Arousal</td>
<td>−0.163</td>
<td>−0.184</td>
</tr>
<tr>
<td>Cognitive</td>
<td>−0.060</td>
<td>−0.031</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>−0.073</td>
<td>0.067</td>
</tr>
<tr>
<td>Total</td>
<td>−0.159</td>
<td>−0.149</td>
</tr>
</tbody>
</table>

*\(p<0.05\); **\(p<0.01\).

**Table 4.** Partial correlations (controlling for stress) between Anxiety Sensitivity Profile scales and pain indexes (averaged across coping conditions) separated by sex (male vs female).

<table>
<thead>
<tr>
<th></th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Threshold</td>
<td>Tolerance</td>
</tr>
<tr>
<td>Arousal</td>
<td>−0.493*</td>
<td>−0.476*</td>
</tr>
<tr>
<td>Cognitive</td>
<td>−0.378</td>
<td>−0.462*</td>
</tr>
<tr>
<td>Gastrointestinal</td>
<td>−0.239</td>
<td>−0.014</td>
</tr>
<tr>
<td>Total</td>
<td>−0.595**</td>
<td>−0.574**</td>
</tr>
</tbody>
</table>

*\(p<0.05\); **\(p<0.01\).
pain. This extends the findings of previous experimental studies that have used the ASI by demonstrating that this relationship can also be found when using an alternative measure of this construct. Furthermore, the use of the ASP allowed us to examine in more detail the various subcomponents of AS. This revealed that the cognitive and gastrointestinal domains seem to be particularly related to pain experiences. Together this not only confirms previous experimental work that AS is related to experimental pain sensitivity, but it extends it by indicating that visceral (gastrointestinal) experiences may be an area of particular interest. Such a view is consistent with those of Norton, Norton, Asmundson, Thompson, and Larsen (1999) who suggested that AS may be important in a range of conditions that are characterized by abnormal somatic sensations, including those with a gastrointestinal component. They found that AS was higher in students who met criteria for functional dyspepsia, a condition which is associated with abdominal pain, and which is related to anxiety conditions such as panic.

Whilst it may initially seem as if the arousal component of the ASP was not related to cold pressor pain as initially hypothesized, such a conclusion is premature in light of the second goal of the current study, which was to determine whether sex differences exist in the relationships found between AS and pain. For males, but not females, the fear of arousal symptoms and cognitive concerns scales were related to lower pain thresholds and pain tolerance levels. An additional sex-specific finding was that the various components of the ASP were generally related to the sensory and affective components of the pain experience in females, but not for males (although there was a significant relationship between affective pain and the cognitive concerns component of the ASP in males). Previous work into cold pressor pain responses using the ASI suggests that the AS / pain relationship in women may be stronger for self-report components of pain than behavioural measures, such as threshold and tolerance (Keogh & Birkby, 1999, see also Uman et al., this issue). The present results suggest that such sex-specific dissociation between self-report and behavioural pain measures can also be found when using an alternative measure of AS. Furthermore, that the gastrointestinal component of the ASP was found to be related to pain in women, but not men, is also of interest as it is consistent with evidence that there are similar sex differences in gastrointestinal conditions (e.g. irritable bowel syndrome; Chial & Camilleri, 2002; Lee, Mayer, Schmulson, Chang, & Naliboff, 2001).

The final objective of this study was to examine whether different coping instructions, relating to acceptance and control-based approaches, would result in differences in the AS / pain relationship. No clear differences were found. We did find that overall pain tolerance levels were lower (in both coping conditions) in women if they received the control instructions first. This might suggest that either acceptance has a sex-specific protective effect, even when subsequently given contradictory instructions, or women find it harder to “give up control” when they are first instructed to use it as a coping mechanism for pain. However, such explanations are speculative, based on very small cell sizes, and so we need to be cautious about drawing any definite conclusions.

The results involving coping instructions are also surprising given the results of previous studies (Hayes et al., 1999; Keogh et al., 2005), in that we did not replicate the finding that acceptance-based instructions would be more beneficial than control-based ones; in fact, we found the opposite effect. Such a discrepancy could cast doubt on the reliability of the current findings. However, there were some methodological differences between the current study and previous work. For example, all participants received a practice cold pressor trial where no coping instructions were administered. It is possible that this may have influenced the efficacy of the adoption of subsequent coping instructions. Further investigation is required to examine whether the inclusion of such a practice trial, and order generally, influences such effects.

Although the general pattern of results reported here are interesting, we need to be cautious about drawing definite conclusions. While a different pattern of associations were found between men and women, these were not statistical differences between correlation coefficients. An additional issue is the relatively small sample size, which may have restricted the number of significant differences
and/or relationships found. Previous research certainly suggests that there are consistent, although not large, sex differences in both pain and AS (e.g. Stewart, Taylor, & Baker, 1997), and so low power may partly explain why we observed no significant sex differences on either measure. However, at least 1 study with a much larger sample (n<600) failed to find sex differences on the ASP (Olatunji et al., 2005), suggesting that there may be differences between the ASI and ASP in terms of the underlying construct being measured. Issues associated with power may also help explain why significant sex differences were only found on the stress scale of the DASS, and not for the anxiety or depression scales, both of which had a moderate effect sizes. Also, although we considered directly investigating the potential interactions between AS (e.g. high vs low groups) and sex to see whether there are differences in the effects that the 2 coping instructions have on pain reports, it was not possible to address these issues here due to the limited sample size.

Alongside increasing the sample size, future research could consider using different pain induction methods. It is notable that the majority of studies to date have used the cold pressor pain task, and so are generally limited to 1 paradigm. There is evidence to suggest that thermal heat pain may also show AS-related effects (Ochsner et al., 2006, see also Tsao et al., this issue). Demonstrating that such effects occur across different pain induction paradigms would help to determine their generalizability. Similarly, it would be interesting to see more clinically-based studies that examine potential interactions between AS and sex, as well as to see the ASP used more widely in pain research. Finally, it would seem sensible to follow-up on whether it is possible to modify the relationship between AS and pain, as this may help lead towards specific interventions that help those prone to pain deal with such experiences.

In sum, the current study demonstrated that the relationship between AS and experimental pain extends to other measures of AS. It also suggests that there may be differences in the pattern of relationships found based on the subcomponents of AS measured. Finally, the current study also highlights the continued need to consider potential sex differences in both AS and pain research.

References


