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A cognitive–perceptual model of symptom perception in males and females: The roles of negative affect, selective attention, health anxiety and psychological job demands

Laura Goodwin[1], Stephen H Fairclough[2] and Helen M Poole[2]

Abstract

Kolk et al.'s model of symptom perception underlines the effects of trait negative affect, selective attention and external stressors. The current study tested this model in 263 males and 498 females from an occupational sample. Trait negative affect was associated with symptom reporting in females only, and selective attention and psychological job demands were associated with symptom reporting in both genders. Health anxiety was associated with symptom reporting in males only. Future studies might consider the inclusion of selective attention, which was more strongly associated with symptom reporting than negative affect. Psychological job demands appear to influence symptom reporting in both males and females.

Keywords

cognitive–perceptual model, gender differences, negative affect, psychological job demands, selective attention, symptom perception

Introduction

The cognitive–perceptual model of symptom perception encompasses both medical and psychosocial perspectives (Cioffi, 1991) and emphasises the role of attentional processing on symptom assessment. Once an internal sensation is recognised, the search for a cause begins; if the change in physical state can be interpreted as an appropriate physiological response to the environment, then interpretation and formulation of an appropriate behavioural response is straightforward. However, where no feasible explanation for the physiological change exists, then a physiological signal may be assumed to be pathological (Cioffi, 1991).

Attention is inherently selective, and the individual must shift his or her focus from the

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external environment to the internal 'world' of sensory stimuli. The ability to filter sensory information is necessary because human beings have limited capacity as information processors (Cioffi, 1991) and the 'Competition of Cues' hypothesis proposes that there is competition for attentional resources between internal bodily cues and external cues (e.g. how busy one's environment is) (Pennebaker, 1982).

Negative affect and selective attention

Kolk et al.'s (2003) model of symptom perception developed from both the cognitive–perceptual model (Cioffi, 1991) and the 'Competition of Cues' hypothesis (Pennebaker, 1982), highlighting a number of psychological influences on symptom perception. This model underlines the direct effects of trait negative affect (NA), selective attention and external stressors (e.g. employment) on the frequency of symptoms reported (Kolk et al., 2003). NA can influence the direction of attention, causing heightened sensitivity to internal symptoms (Gendolla et al., 2005) and is associated with increased symptom reporting in a range of studies (Vassend and Skrondal, 1999; Williams and Wiebe, 2000). The effect of NA on symptom reporting may be increased in females compared to males (Van Diest et al., 2005).

The tendency to focus attention on bodily sensations is a further predictor of somatic symptom reporting identified in the model (Kolk et al., 2003), associated with heightened physiological or emotional autonomic arousal (Rief and Barsky, 2005), defined as 'selective attention' throughout this article. The model highlights an indirect effect of NA on symptom reporting, mediated by selective attention, proposing that individuals with high NA are more likely to have higher selective attention to the body (Kolk et al., 2003). There is some evidence that this mediation effect may be specific to females (Williams and Wiebe, 2000).

External stressors

There are a number of external stressors in everyday life that may influence the process of symptom perception, including employment, household work and childcare. Different theories have been proposed to explain why such stressors could result in higher symptom reports in females (McDonough and Walters, 2001): the 'differential hypothesis' suggests that women experience higher levels of stress as a result of their social roles and the 'differential vulnerability hypothesis' proposes that females' higher sensitivity and susceptibility to stress results in females self-reporting poorer health compared to males (McDonough and Walters, 2001). Job-related stressors may have a greater impact on physical health in females (Krantz et al., 2005; Stansfeld et al., 1998): examination of the Whitehall II data, a cohort study of more than 10,000 British civil servants based in London (Marmot et al., 1991), demonstrated that self-reported job insecurity was more strongly associated with long-standing illness in females (Ferrie et al., 2005) and the influence of psychological job demands (i.e. the level of mental workload and conflicting demands) on physical functioning was greater in females compared to males (Stansfeld et al., 1998).

Health beliefs

The salience of an internal symptom is additionally determined by health beliefs, which function as 'top-down' (i.e. belief-driven) influences on selective attention (Pennebaker, 1982). Hypochondriacs may amplify benign somatic sensation and misattribute them to a pathological cause (Barsky et al., 1990). The cognitive behavioural hypothesis of health anxiety suggests that individuals who experience health anxiety are more likely to have internally focused attention in order to confirm negative illness hypotheses (Warwick and Salkovskis, 1990), suggesting that selective attention may mediate the effect of health anxiety on symptom reporting.

Gender and symptom perception

A range of studies have shown that women report a higher frequency of physical symptoms

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compared to men (Gijsbers Van Wijk et al., 1999; Gijsbers Van Wijk and Kolk, 1997; Kolk et al., 2003; Popay et al., 1993), and gender differences have been identified in regard to psychological influences on symptom reporting. The 'Competition of Cues' hypothesis further suggests that females may be more influenced by external cues compared to males when detecting somatic symptoms (Roberts and Pennebaker, 1995), and there is evidence that trait NA may have a stronger association with symptom reporting in females than males (Van Diest et al., 2005), indicating that models of symptom perception may differ between men and women. However, there is limited evidence regarding the influence of gender on the process of symptom perception, and we are not aware of any studies that have tested the cognitive–perceptual model of symptom perception in males and females separately.

Objectives

The objectives for this study are as follows: (1) to examine gender differences in symptom reporting and a range of psychological measures (e.g. trait NA); (2) to test a cognitive–perceptual model of symptom perception (Kolk et al., 2003) and examine the direct effects of selective attention, trait NA, health anxiety and external stressors on symptom reporting in males and females separately; and (3) to test indirect paths of trait NA on symptom reporting mediated by selective attention (cognitive–perceptual model of symptom perception) and indirect paths of health anxiety mediated by selective attention on symptom reporting (cognitive behavioural hypothesis of health anxiety) in the model.

The hypotheses for differences between the male and female symptom models are that both trait NA and psychological job demands will be more strongly associated with symptom reporting in females, compared to males, and that selective attention will mediate the associations between trait NA and symptom reporting only in females.

Methods

Procedure and sample

Recruitment for this cross-sectional study was facilitated by unions in the United Kingdom who agreed to advertise the study in their online or paper newsletter. Seventeen unions took part in the study, and the unions with the highest participation were Unison (192 participants) and the National Union of Teachers (133 participants). The information that was distributed included a brief explanation of the study aims and objectives and details of how to access the online survey. The questionnaire took approximately 20 minutes to complete. The survey remained online for a 5-month period, during which time participants were able to complete it on one occasion. Participants were informed that all information was confidential and anonymous and were provided with a contact email for the researcher if they had any further questions. Ethical approval was granted for this study by the LJMU University Ethics Board. The final sample for this study was 761 participants (263 males and 498 females) who were a self-selected sample.

Measures

Symptom reporting. For the purposes of this research, a new symptom report questionnaire was developed. The questionnaire was based on the Pennebaker Inventory of Limbic Languidness (PILL; Pennebaker, 1982), which was designed as a trait measure of symptom reporting, that is, the disposition to report symptoms. The wording from the original questionnaire was amended to assess the 'state' level of symptoms in that participants were asked if they were 'currently experiencing' each of 54 common physical symptoms and sensations, to avoid retrospective reporting bias, and the scale was found to have good internal consistency in this study (Cronbach's α = .86). A number of studies have provided evidence for the validity of the scale with high PILL scorers reporting more symptoms and more intense symptoms than

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participants with low PILL scores (Pennebaker, 1982; Watson and Pennebaker, 1989). The types of symptoms that were assessed by this questionnaire included the following: 'lump in throat', 'indigestion or heartburn' and 'sweat even in cold weather'.

NA. The Positive and Negative Affect Schedule (PANAS) was designed to measure trait positive affect (PA) and NA (Watson et al., 1988). The schedule involves two 10-item mood scales, and participants are asked to rate how they feel 'in general'. The scale has good reliability with Cronbach's α ranging from .84 to .87 (Watson et al., 1988), and the trait version had good internal consistency in this study (Cronbach's α = .91). The external validity of the scales was tested in a longitudinal study, in which perceived daily stress was correlated with intra-individual fluctuations in NA but not PA, and social interaction reports were more strongly related to PA than to NA (Watson, 1988)

Selective attention and health anxiety. The Private Body Consciousness Questionnaire (PBC) is a 5-item scale designed to measure sensitivity to the body and selective attention to internal symptoms, while avoiding overlap with hypochondriasis (Miller et al., 1981). The PBC has strong internal consistency, and scores are correlated with other measures of self-consciousness (Miller et al., 1981). Items were scored from 0 ('extremely uncharacteristic') to 4 ('extremely characteristic'), with acceptable internal consistency (Cronbach's α = .78) in the current study. The Autonomic Nervous System Reactivity (ANS-R) scale asks participants to rate the frequency of how often they notice 27 sensations and symptoms relating to the high sympathetic reactivity of the autonomic nervous system, from 1 ('never') to 5 ('always') (Porges, 1993). Items 1, 7, 8, 9, 14, 17, 20, 21 and 23 were removed from the ANS-R due to overlaps with items from the symptom report questionnaire. The new 18-item version was found to have good internal consistency (α = .88). In this study, scores from the PBC and ANS-R were combined as a measure of selective attention to the body, which had good internal consistency (Cronbach's α = .85).

The Health Anxiety Inventory (HAI) was validated in a sample of 24 individuals with diagnosed hypochondriasis, 19 anxious controls and 159 non-clinical controls. The HAI was found to reliably differentiate between the hypochondriacal sample and the anxious sample with the control sample (Salkovskis et al., 2002). The internal consistency of the scale was revealed to be good (α = .95), and it had reasonable test-retest reliability (.76) (Salkovskis et al., 2002). A short version of the HAI was developed including 14 items that had the highest item-total correlations in the hypochondriacal sample, which was found to have satisfactory internal consistency (.89) (Salkovskis et al., 2002). The 14-item version of the HAI was found to have good internal consistency in the current study (Cronbach's α = .87).

External information. Psychological job demands were assessed in the current study as a measure of external stressors, measured by the Job Content Questionnaire (Karasek et al., 1998). The Job Content Questionnaire was designed to evaluate social and psychological work characteristics (Karasek et al., 1998). The Psychological Job Demands Scale assesses the level of mental workload, organisational constraints regarding task completion and conflicting demands and has acceptable internal consistency (α = .60) (Karasek et al., 1998).

Statistical analysis. (1) Preliminary analyses examined gender differences in the frequency of symptoms, trait NA, selective attention, health anxiety and psychological job demands using independent samples t-tests in SPSS (SPSS Inc., 2008) with gender as the between-subjects factor. (2) The symptom perception model was tested separately in the male and female samples using Amos v18 (Arbuckle, 2009), and the standardised coefficients and model fit statistics were reported. The estimation method that was used was Maximum

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Likelihood, and the data were within a normal distribution (all absolute skewness and kurtosis values were lower than 1.5). The model was over-identified. All variables were observed: three variables were exogenous (trait NA, health anxiety and psychological job demands) and two were endogenous (selective attention and symptom frequency). Error terms were drawn to the endogenous variables. It was predicted that NA, health anxiety and psychological job demands would have shared residual variance, so these exogenous variables were correlated. The model fit was assessed using the χ^2, comparative fit index (CFI), adjusted goodness of fit index (AGFI) and root mean square error of approximation (RMSEA) statistics. Bootstrap resampling from the original sample was conducted using Amos to examine indirect effects: 200 bootstrap replications were performed, and this analysis estimated the standardised coefficients, the significance tests and 90% confidence intervals (CIs) for the indirect effects.

Results

Sample characteristics

The final sample included 263 males and 497 females (see Table 1 for the demographic characteristics). The largest proportion of the sample was White British, and the highest proportion of the male sample was in professional occupations, while females most commonly classified themselves in a managerial or teaching role. The majority of the full sample was in

Table 1. Descriptives and frequencies showing the demographic characteristics of males and females.

	Males (N = 263)	Females (N = 97)
	Mean (SD)	Mean (SD)
	n (%)	n (%)
Age (years)	43.70 (10.63)	41.45 (10.99)
Hours worked per week	38.45 (11.55)	34.86 (12.05)
Marital status		
Married/living with partner	198 (75.29)	370 (74.45)
Single	52 (19.77)	79 (15.89)
Separated/divorced/widowed	13 (4.94)	48 (9.66)
Ethnicity		
White British	243 (92.40)	461 (92.76)
White – other background	14 (5.32)	21 (4.23)
Black African	0	2 (.40)
Black Caribbean	0	2 (.40)
Asian	3 (1.14)	4 (.80)
Other	3 (1.14)	7 (1.41)
Occupational group		
Managerial/teacher	63 (42.00)	207 (41.60)
Professional	108 (41.10)	164 (33.00)
Clerical/minor supervisory	39 (14.80)	115 (23.10)
Skilled manual	46 (17.50)	7 (1.40)
Semi-skilled manual	3 (1.10)	3 (.60)
Unskilled manual	4 (1.50)	1 (.20)

SD: standard deviation.

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Table 2. Gender differences in symptom reporting and the psychological measures.

	Males (N = 263)	Females (N = 497)	Gender difference
	Mean (SD)	Mean (SD)	t (p)
Frequency of symptoms	10.53 (7.31)	11.93 (7.20)	−2.53 (.011)
Negative affect	19.63 (7.99)	21.45 (8.38)	−2.89 (.004)
Selective attention	37.11 (10.29)	40.58 (10.74)	−4.30 (.000)
Health anxiety	10.01 (5.82)	10.48 (5.65)	−1.08 (.281)
Psychological job demands	36.33 (8.49)	36.99 (8.62)	−1.01 (.312)

SD: standard deviation.

white-collar occupations (clerical/minor supervisory, managerial/teacher, professional) and was either married or cohabiting.

Gender differences in symptom reporting, NA, selective attention, health anxiety and psychological job demands

Table 2 shows that females reported more symptoms than males. Females also reported higher trait NA and selective attention, but there was no gender difference for psychological job demands and health anxiety.

Path analysis models of the cognitive–perceptual model of symptom perception

The male and female models of symptom perception are displayed in Figures 1 and 2, respectively. The model fit statistics for the male model are χ^2 (p): .43 (.51), CFI: 1.00, AGFI: .99 and RMSEA: .00 and for the female model are χ^2 (p): 2.30 (.13), CFI: 1.00, AGFI: .97 and RMSEA: .05. The model statistics for both the male and female models suggest that the models have very good fit, evidenced by the small χ^2 and RMSEA values and the large AGFI value (Tabachnick and Fidell, 2006). The squared multiple correlations show that 46 per cent of the variance in symptom frequency was explained by the male model and 42 per cent of the variance in the female model.

Selective attention was most strongly associated with symptom frequency in the male and female models. Psychological job demands were also significantly associated with symptom frequency in both models. Trait NA was significantly associated with symptom frequency in females, but not in males, and health anxiety was significantly associated with symptom frequency only in males. In males, trait NA had a significant indirect effect on symptom frequency that was mediated by selective attention (β = .12, 90% CI = .05–.19, p < .01), and the effect of health anxiety was also mediated by selective attention (β = .21, 90% CI = .11–.28, p < .05). In females, both trait NA (β = .14, 90% CI = .11–.19, p < .01) and health anxiety (β = .12, 90% CI = .09–.16, p < .05) had significant indirect effects on symptom frequency that were mediated by selective attention.

Discussion

Females reported more somatic symptoms than males, yet the cognitive–perceptual model of symptom perception was shown to fit both the male and female samples. This study provides support for the future inclusion of selective attention in the studies of symptom reporting; which was more strongly associated with symptom reporting than trait NA in males and females. The latter variable is more commonly included in studies in this field but was not directly associated with symptom frequency in males highlighting a potential gender difference.

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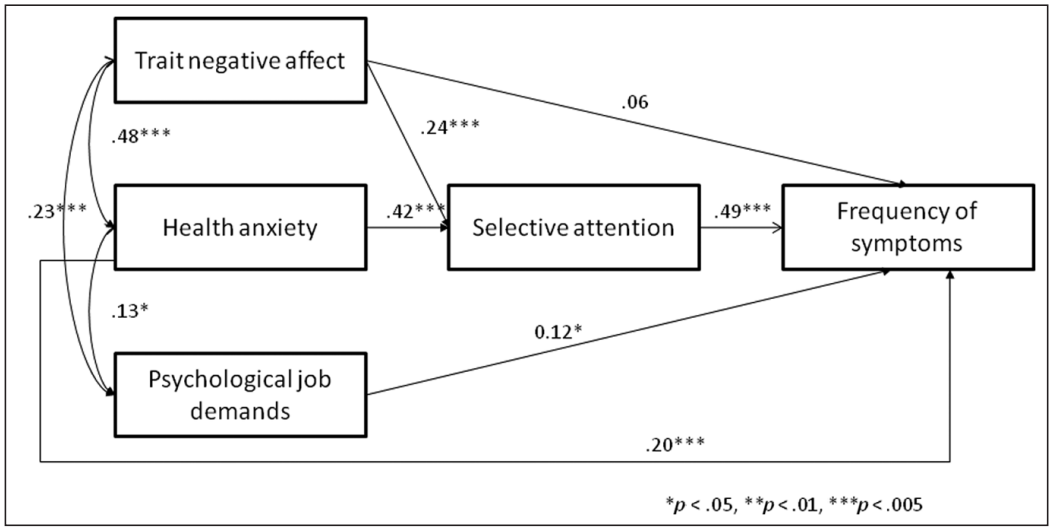

Figure 1. A cognitive–perceptual model of symptom perception in males (N = 263).

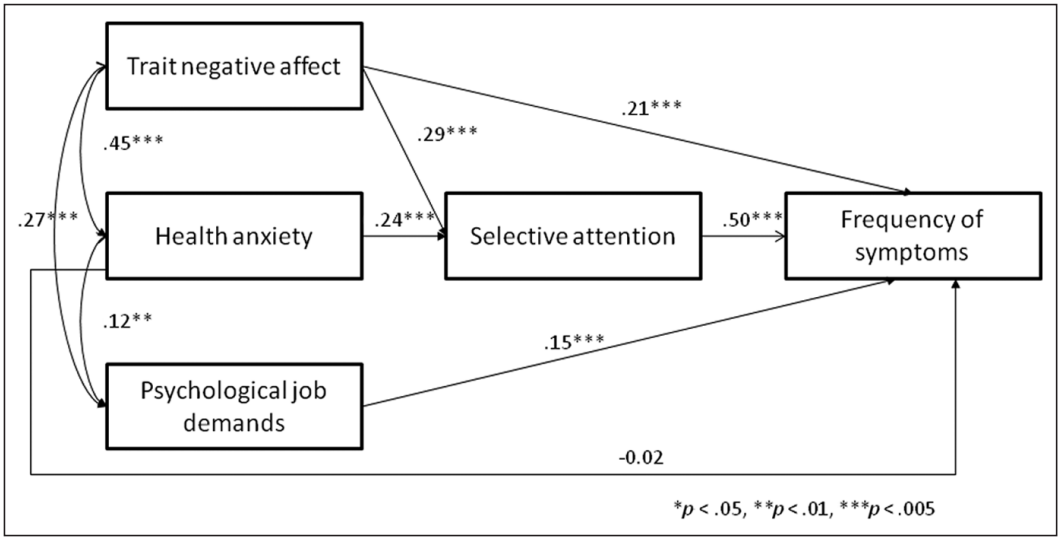

Figure 2. A cognitive–perceptual model of symptom perception in females (N = 497).

Selective attention mediated the effect of trait NA on symptom reporting in both genders. Psychological job demands was associated with symptom reporting in both males and females, providing little support for the 'Competition of Cues' hypothesis that females are more vulnerable to the influence of these external stressors. Males who were anxious about their health were found to report more somatic symptoms compared to those reporting lower levels of health anxiety, but this direct effect was not shown in females.

Trait NA is utilised in many studies to control for a negative reporting bias (Houtveen and Oei, 2007), particularly when the reports are retrospective. In this study, we attempted to reduce the risk of retrospective bias by using a current measure of symptom reporting (Kolk et al., 2003), yet we still found that NA was associated with symptom reporting in females. We supported previous research that the effect of NA may be greater in females than in males (Van Diest et al., 2005). There was support for a 'joint-impact' hypothesis that individuals who have high NA are likely to report somatic symptoms because they have increased selective attention to the body (i.e. selective attention mediates the effect of NA) (Gendolla et al., 2005). This hypothesis was

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supported in both males and females (Kolk et al., 2003), in disagreement with some existing studies (Williams and Wiebe, 2000).

Selective attention is an important aspect of the cognitive–perceptual model (Kolk et al., 2003), and this study found support for a strong association between selective attention and symptom reporting in both males and females. Attentional strategies may therefore be useful in reducing the impact of symptoms. Distraction techniques have been shown to be effective for the management of physical and psychological symptoms associated with chronic pain (Villemure and Bushnell, 2002), and these strategies may have more utility in patients with high selective attention to the body who may also be more likely to have other functional somatic syndromes (e.g. irritable bowel syndrome; Keough et al., 2011). Surprisingly, this study found that health anxiety was only directly associated with symptom reporting in males, but not in females, suggesting that top-down cognitive processing plays a greater role in symptoms perception for males. However, there was a significant indirect effect of health anxiety mediated by selective attention in both genders; females who worry about their health appear not to report more symptoms directly as a result of this anxiety but because these top-down beliefs about health focus attention internally to bodily sensation (Warwick and Salkovskis, 1990).

Psychological job demands were utilised as a measure of external stressors, which were found to be associated with symptom reporting in both males and females. Previous findings that psychological job demands were more strongly associated with self-reported health in females (Stansfeld et al., 1998) were not supported. The current study also disagrees with Roberts and Pennebaker's (1995) 'Competition of Cues' hypothesis that females are more vulnerable to the influence of external stressors.

Strengths and limitations

This study benefited from having a good sample size of both male and female participants from occupational samples. It was unique in incorporating health anxiety in the cognitive–perceptual model and in utilising psychological job demands as a measure of external stressors. The main weakness of this study was in relation to the sample in which participants were self-selected. Due to the study being completed online, we were not able to calculate a response rate or compare those participants who took part in this study to those who did not. The participants in this study were predominantly in professional and 'white-collar' occupations, and the models may not generalise to a full spectrum of occupations and do not appear to reflect the breakdown of occupational groups in the United Kingdom. There are fewer males in manual occupations in the current study, compared to the general population, and there are more males and females in professional and managerial occupations in the current sample. Consequently, this study appears to be biased towards higher social economic groups, and there is some evidence from previous research that somatisation may be higher in lower social economic groups (Lieb et al., 2002).

Implications of this study

Primarily, this study highlights the importance of selective attention in this field, suggesting that NA may not be the most influential factor in symptom perception research. Attentional strategies may therefore be useful in reducing the impact of symptoms, and interventions relating to attentional focus may be helpful for individuals with different functional somatic syndromes, as opposed to only in those with chronic pain. Psychological job demands were shown to influence symptom reports in both males and females in this study, and males should not be viewed as less prone to the influence of work-related stressors compared to females. Programmes aimed at reducing occupational stress should therefore be targeted at both genders. Finally, there was evidence that males who are health anxious may be at greater risk of reporting poorer subjective health and

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consequently may benefit more from an intervention to target this anxiety compared to females.

Conclusions

This is the first study to replicate Kolk et al.'s (2003) cognitive–perceptual model of symptom perception in males and females separately, explaining almost half of the variance in both genders. The findings promote the inclusion of selective attention in future research in this field, which was shown to be most strongly associated with symptom reports in males and females. Contrary to predictions, psychological job demands were also associated with symptom reporting in both genders. Gender differences included that NA was only associated with symptom reporting in females, and health anxiety was only associated with symptom reporting in males. Both trait NA and health anxiety were found to influence symptom reporting indirectly, via selective attention, supporting a number of prior hypotheses.

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