The Cohen-Hoberman Inventory of Physical Symptoms: Factor structure, and preliminary tests of reliability and validity in the general population

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Abstract

Objective: The present study aimed to investigate the factor structure and psychometric properties of the Cohen-Hoberman inventory of physical symptoms (CHIPS). Construct and discriminant validity were examined by assessing associations between factors and subjective health complaints (SHC) inventory subscales in addition to measures of pain sensitivity, perceived stress and psychological distress. **Design:** A cross-sectional online survey was conducted with 535 healthy individuals from the general population (80.6% female, mean age = 29.80). **Main Outcome Measures:** Participants completed CHIPS, SHC, perceived stress scale, pain sensitivity questionnaire, and hospital anxiety and depression scale. **Results:** Principal components analysis demonstrated that CHIPS comprised 8 'symptoms' factors as follows; 'sympathetic/cardiac' (7 items; α=.827), 'muscular' (6 items; α=.752), 'metabolic' (5 items; α=.736), 'gastrointestinal' (5 items; α=.714), 'vasovagal' (4 items; α=.743), 'cold/flu' (2 items; α=.837), 'headache' (2 items; α=.690) and 'minor haemorrhagic' (2 items; α=.309). Significant correlations were observed between factors and SHC subscales (moderate-high), pain sensitivity (negligible-low) and levels of perceived stress and anxiety (low-moderate) indicating good construct, and discriminant validity, respectively. **Conclusions:** CHIPS is a multidimensional and internally consistent measurement of physical symptoms. The postulated factor structure may be used for research purposes particularly in health psychology, to consistently differentiate between clusters of self-reported symptoms.

Key words: Physical symptoms, distress, subjective health, factor structure

Introduction

Physical symptoms

Subjective health complaints are very common; can often be acknowledged as 'normal', and are not necessarily associated with any specific diagnosis of illness. However, the experience of physical symptoms that do not meet the diagnostic criteria for particular illnesses or disorders can have noticeable negative effects on physical and psychological well-being in the general population. Minor physical illnesses which can be exemplified by a range of physical symptoms can cause significant distress for sufferers, which in combination with various extrinsic situational variables can often lead to accentuated negative consequences. This can have particular implications for employee absence rates (Gabbay, Shiels, & Hillage, 2015; Michie & Williams, 2003); productivity in the workplace (Meerding, IJzelenberg, Koopmanschap, Severens & Burdorf, 2005); and various other problems such as inability to work and unemployment (e.g Bartley, 1994; Schuring, Burdorf, Kunst, & Mackenbach, 2007); social isolation (House, Landis & Umberson, 1988); economic burden (Allender, Foster, Scarborough, & Rayner, 2007; Xu, et al., 2003); and issues with sports participation (Kujala, Taimela, & Viljanen,1999). It is also conveyed that the majority of sickness absences are often solely centred on subjective reports from patients (Ursin, 1997).

In the general population, everyday physical symptoms are highly prevalent, can be bothersome and can even cause substantial distress. The most common symptoms measured in a community sample of over 13,000 individuals were found to be joint pains (36.7%), back pain (31.5%), headaches (24.9%), chest pain (24.6%), pain in the limbs (24.3%), stomach pain (23.6%), fatigue (23.6%), and dizziness (23.2%) with almost one third of symptoms being attributed to a psychosomatic or unexplained cause (Kroenke, & Price (1993).

Although it must be acknowledged that cause and effect cannot always be reliably inferred, it is clear that further systematic research and the need for reliable assessment tools are warranted in exploration of the experience and adverse effects of common everyday physical symptoms. Furthermore, an abundance of medically unexplained symptoms with no obvious underlying organic cause, in the absence of appropriate medical treatment, can be equally as distressing as clinically diagnosed symptoms, particularly in situations where these symptoms become chronic (Walker, Unützer, & Katon, 1998). It is, therefore, of great importance for research to be conducted into the experience of general physical symptoms in non-clinical populations in order to explore and develop ways in which to understand and ultimately overcome their various harmful effects. Further research may be particularly important for developing and implementing interventions to ameliorate symptoms and reduce illness progression.

The experience of physical symptoms has been linked to indices of psychological well-being including fluctuations in both negative (Leventhal et al., 1996; Watson & Pennebaker; 1989) and positive (Watson, 1988) affect, personality factors including neuroticism (Brown & Moskowitz; 1997), type D personality (Williams & Wingate, 2012), and optimism (Rasmussen, Scheier, & Greenhouse, 2009). An abundance of literature has also linked typically psychological concepts such as chronic stress to increased incidences of a variety of psychological and physical health outcomes (Juster, McEwen & Lupien, 2010) including depression and anxiety; increased susceptibility to viruses such as the common cold (Kiecolt-Glaser et al., 1987); and cardiovascular disease (Steptoe, & Kivimäki, 2012). This further exemplifies the important associations between psychological states and physical health and the necessity for easy to use self-reported health assessment tools.

Measurement

An important consideration in alleviating the distress and consequences associated with everyday physical symptoms is the subjective assessment of the symptoms themselves. It is important to assess the experience of everyday physical symptoms in the general population, particularly to aid in the initial assessment of possible declines in physical and psychological health over periods of time. However, there is no general consensus on how to measure these symptoms. Some large surveys simply rely on standalone questions, and other measures tap into other aspects of ill-health such as quality of life or levels of disability (e.g. The Health Assessment Questionnaire; Fries, Spitz, Kraines, & Holman, 1980; The Health status index; Kaplan, Bush, & Berry,1979). A number of health related assessment tools are currently available including the Nottingham Health Profile (Hunt, McEwen & McKenna, 1985), the Short Form Health Survey (Ware & Sherbourne, 1992) and the Child Health Questionnaire (Landgraf, Abetz, & Ware, 1996). However, these tools are typically implemented in clinical samples and are less appropriate for use in the general population. Furthermore, a number of specific scales have also been developed for use in clinical populations such as diabetics, cancer patients and sufferers of other chronic conditions (e.g. Symptom Distress Scale; McCorkle & Young, 1978). For research purposes access to short and simple measures of perceived health problems and overall ill health in non-clinical populations is therefore warranted. A number of brief tools have also been developed to specifically and simply measure the experience of symptoms (e.g. SHC; Eriksen, Ihlebaek and Ursin 1999) which are particularly useful for research in healthy populations as they fundamentally gauge the event to which general everyday symptoms can be bothersome for individuals on a straightforward and easily-scored rating scale.

A number of complications may arise in adequately measuring physical symptoms as a construct in the general population. The frequency and severity of physical symptoms tend not to follow a normal distribution (i.e. data is often skewed) as many people do not suffer from the more frequent symptoms at any one time (Eriksen, et al., 1999). This poses particular problems for statistical analyses of symptom data in a research context. Furthermore, all symptoms are not necessarily demonstrable of general ill health and can be interpreted differently. If they are all similar, a high overall score could represent an isolated illness with similar symptoms. On the other hand if an individual experiences lots of different symptoms it could be representative of more general poor health status. It may, therefore, be preferable to consider the experience of symptoms on a case by case basis, although this is timely and complicated. It would, therefore, be beneficial to consider physical symptoms as groups or clusters of similar ailments which may logically be related to a common underlying cause and/or occur simultaneously.

Symptom clusters

General everyday symptoms, although collectively representative of poor health, are neither entirely interrelated nor completely separate. It can be argued that some physical symptoms may be distinct but some may also cluster together into similar symptom groups. This is particularly useful for the diagnosis of illnesses as attributing ill-health to single, or even a number of independent symptoms, can be seen as inadequate. Furthermore, different symptoms can be differently associated with not only distinct illnesses but also other extrinsic factors. For example; musculoskeletal complaints can often be associated with job type or working conditions (Johansson & Rubenowitz, 1994) and there is evidence of links between anxiety symptoms and low levels of social support (Zimet, Dahlem, Zimet, & Farley, 1988).

Ursin et al., (1988) were the first to conduct a factor analysis of subjective health complaints in otherwise healthy individuals and found four independent factors: 'muscle pain'; gastrointestinal problems; allergies/colds and pseudoneurological complaints. Similarly, Eriksen et al., (1999) found that subjective health complaints comprising the subjective health complaints (SHC) inventory could be split into five separate factors: musculoskeletal pain; allergies; gastrointestinal problems; pseudoneurology and flu; (Eriksen et al., 1999). Whilst the SHC is a useful tool for assessing general health complaints it does include some diagnoses-dependent items which may only be experienced in certain clinical populations (e.g. eczema, asthma, dyspepsia, obstipation). Furthermore, the 'allergies' subscale contains theoretically dissimilar items which seem unlikely to co-occur (e.g. chest pain and eczema) and as such, this cluster label is somewhat ambiguous.

A range of intrinsic and extrinsic factors can also contribute to the variations of the self-report of physical symptoms (Pennebaker, 1982). It could be argued that tools which assess subjective experience (e.g. severity, frequency, inconvenience etc.) of physical symptoms may be correlated with or demonstrable of psychologically based concepts and in fact measure levels of intolerance to discomfort or distress, therefore only representing an individual's perception of their symptoms. It could therefore be suggested the scores from a self-report scale of physical symptoms could also be related to levels of psychological morbidity (i.e. anxiety and depression), perceived stress and pain sensitivity.

The Cohen & Hoberman Inventory of Physical Symptoms

The Cohen & Hoberman Inventory of Physical Symptoms (CHIPS; Cohen and Hoberman, 1983; available online at http://www.midss.org/content/cohen-hoberman-inventory-physical-symptoms-chips) was designed as a measure of perceived burden due to the experience of a range of physical symptoms. The measure has been used to assess experience of physical symptoms in different populations and has been utilised in research into individual differences and health (e.g. Smolderen, Vingerhoets, Croon, & Denollet, 2007; Stevenson & Williams, 2014; Williams, Abbot and Kerr, 2015). The scale comprises a list of 33 common everyday symptoms (e.g. 'acne', 'diarrhoea', 'heart pounding or racing') and asks respondents 'how much that problem has bothered or distressed you during the past two weeks including today'.

The CHIPS is an easily administered tool for quickly determining participant's experiences of everyday physical symptoms. This is particularly useful in research studies aiming to assess physical symptoms and health complaints in various populations. For example; the CHIPS has been used to assess physical health outcomes in studies examining social support in rape victims (Campbell et al., 2001), the effects of weight training in law enforcement officers (Norvell & Belles, 1993) and the relationship between spirituality and adjustment to daily stressors (Kim & Seidlitz, 2002) thus exemplifying the measure's broad utility. The CHIPS can also be used to define health related variables (e.g. optimism) and can have implications for the design and component integration of psychological therapies or behavioural treatments aimed at alleviating physical symptoms (Heigel, Stuewig & Tangney, 2010). Furthermore, physical symptom scales such as the CHIPS can be used to assess any changes in the frequency of, and psychological distress caused by, symptoms in response to treatment (e.g. cognitive behavioural therapy for medically unexplained symptoms; Speckens et al., 1995).

However, the CHIPS is not recommended for diagnostic purposes as it is limited to only 33 specific items and does not readily assess particular illnesses or disorders. Furthermore, as it is subjectively scored it can be affected by individual differences in sensory-processing sensitivity and distress (Benham, 2005). It is also somewhat limited currently, as it provides only a global score based on all symptoms, whereas it seems logical that certain symptoms will likely co-occur given that they may have a common underlying cause. On this basis, it would be useful to consider whether reliable and valid symptom clusters emerge on this instrument. However, the potential factor structure of the 33 item CHIPS has yet to be explored in a sample of the general population in order to provide a symptom sensitive measure of physical health complaints that can ameliorate the shortcomings of the of the SHC's ambiguous 5-factor subscale solution.

Aims and objectives

The primary aim of the current paper is to explore and discuss the potential underlying factor structure and psychometric properties of the CHIPS; a widely utilised nondiagnostic self-report assessment tool of general physical symptoms. The secondary aim of this paper is to assess the extent to which the different factors that emerge from the CHIPS measure are associated with a number of psychological variables, namely pain tolerance, anxiety, depression and perceived stress, in order to determine the construct validity of the CHIPS.

Method

Participants

A non-experimental survey design with 535 healthy adults aged between 18 and 65 years (80.6% female, mean age = 29.80 [±12.90]) was employed.

Demographic data was extracted including age, gender, employment status, residency, body mass index and household income. Self-report questions required participants to provide date of birth, height, weight, and country of residency. Multiple choice scales determined employment status and household income. See table 1 for demographic information.

[Table 1 here]

Participants were recruited using a variety of recommended online platforms (Branley, Covey, & Hardey, 2014) which included dedicated participation sites (e.g. callforparticipants.com), social media (e.g. Facebook, Twitter, Reddit, and LinkedIn), university and research group mailing lists, student participation pools as well as various websites and online forums (e.g. Mums.net). Snowball sampling was also used to maximise recruitment by encouraging participants to refer the survey to friends and family friends, and/or share the study on social media. The study was also advertised via the distribution of posters and leaflets within a North East University. Participation was entirely optional and participants who wished to take part accessed the survey via an anonymous link.

First and second year undergraduate psychology students received course credit for their participation in the study; otherwise all participants were unpaid volunteers. Ethical approval was gained from the institutional ethics board prior to the study commencement and participants were advised of their rights to withdraw. As the study aimed to gauge levels of common physical symptoms in the general population of healthy individuals, exclusion criteria included those with diagnosed mental health issues, physical conditions or sleep disorders as these factors could influence the levels of symptoms reported. Ineligibility was defined as receiving a formal medical diagnosis. These exclusion criteria were presented in all recruitment adverts, emails and study instructions.

Measures

Cohen & Hoberman's inventory of physical symptoms

The CHIPS is a list of 33 common physical symptoms and asks respondents to rate 'how much that problem has bothered or distressed you during the last two weeks including today?'. The symptoms include items such as 'Back pain' and 'Diarrhoea' (see table 2 for full item list) and are rated on a 5-point Likert scale ranging from (0) 'not been bothered by the problem' to (4) 'extremely bothered by the problem' for how much that item bothered the individual during the past two weeks. The total score is the sum of the responses on the 33 items (possible score range 0-132). Cronbach's alpha for the overall CHIPS scale was .92 indicating good internal consistency.

The subjective health complaints inventory

The subjective health complaints inventory (SHC; Eriksen et al., 1999) comprises 29 items concerning subjective somatic and psychological complaints experienced during the last 30 days. The inventory provides five individual scores indicating severity and frequency of five subcategories of symptoms. Severity of each complaint is rated on a 4-point scale (0= 'not at all' to 3 = 'serious') and is also scored for duration (number of days) during the last 30 days. The subscales were scored by simple summation of the raw scores for severity for each of the items, higher scores indicated increased subjective severity of these health complaints with maximum scores of 24 for musculoskeletal pain, 21 for pseudoneurology, 21 for gastrointestinal problems, 15 for allergy and 6 for flu-like symptoms. A duration score could also be calculated from the scale by multiplying severity (0 - 3 on single items) by duration (number of days/10). Eriksen et al., (1999) indicated each of the subscales exhibited adequate internal consistency as follows: flu-like symptoms (2 items; α= 0.67) musculoskeletal pain (8 items; α= 0.74), pseudoneurology (7 items; α=0.73), gastrointestinal problems (7 items; α= 0.62) and allergies (5 items; α= 0.58).

It must be noted that according to the authors (Eriksen et al., 1999) the data gathered using the sum scores of this scale can often be skewed within healthy populations and small samples, therefore Eriksen et al., (1999) suggest that the most useful way of using the SHC is to report single item scores or the number of individuals with scores above 0 on each of the 5 subscales. However, in the current study, summed severity scores from the five subscales were used as continuous data to compare with the data extracted from the CHIPS.

The hospital anxiety and depression Scale

Psychological distress was measured using the hospital anxiety and depression scale (HADS; Zigmond & Snaith, 1983). The HADS comprises 14 items each with 4 answers coded between 0 and 3 (positively worded items are reversed scored). 7 items measure anxiety (α= 0.83) and 7 items measure depression (α=0.82), a separate score is derived for each of the scales with higher scores indicating higher levels of anxiety and depression, respectively.

The perceived stress scale

The perceived stress scale (PSS) (Cohen, Kamarck, & Mermelstein, 1983) was used to assess perceived stress. The PSS is a 10-item scale that assesses how respondents have experienced and dealt with stressful situations in the past month and includes items such as "felt nervous and stressed?", and "felt that you were unable to control the important things in your life?" Response choices are on a 5-point Likert scale and range from (0) "never" to (4) "very often" and a number of positively worded items are reverse scored. Total scores range from 0 to 40, with higher scores indicating higher levels of perceived stress. Cronbach's alpha for the PSS was calculated as 0.85 indicating high internal consistency.

The pain sensitivity questionnaire

The pain sensitivity questionnaire (PSQ; Ruscheweyh et al., 2009) was used to assess pain tolerance. The PSQ comprises 17 items (3 of which are filler items) and each item describes a situation in which one may feel pain. Participants are required to indicate on a ten point scale how painful they would imagine this situation to be (0=not at all painful at all, 10 = most severe pain imaginable). High scores indicate higher levels of self-reported pain sensitivity. The PSQ provides 3 scores, a minor pain score (7 items), moderate pain score (7 items) and total pain sensitivity score (14 items).

Treatment of Data

Missing values for CHIPS was minimal (0.102%) and ranged from 0.0% - 0.6% for each item. Missing values were managed in the PCA using pairwise deletion as there were so few missing values, to retain as much information as possible. Data for the other questionnaires was included on the basis that there were no more than two missing values for each measure per participant. Missing values for the SHC were replaced with 0, otherwise mean substitution was implemented. This is in line with similar missing data methods used in a variety of questionnaire based studies (Roth, 1994). Therefore, 535 cases were entered into the analyses for the CHIPS and HADS data, 534 for the SHC, 524 for the PSS and 521 for the PSQ.

Partially following recommendations by Hinkin (1995, 1998), exploratory factor analysis (Principal Components Analysis with Varimax rotation and Kaiser Normalization) was conducted on the CHIPS data in the first instance using IBM SPSS 22. The internal consistency, construct validity with the subscales of the SHC inventory, and discriminant validity with measures of pain sensitivity, psychological distress and perceived stress, were also explored.

Principal components analysis was chosen as the most appropriate statistical method in order to achieve an accurate, lower-dimensional representation of the CHIPS data with minimal loss of information regarding everyday physical symptoms (Kambhatla, & Leen, 1997).

The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis (KMO = .897 (meritorious according to Hutchenson and Sofroniou, 1999). Bartlett's test of Sphericity also showed a significant result (BS (528) = 6479.893, $p<.001$). Therefore both tests suggested the suitability of the data for PCA. The 33 items of the scale were entered into the factor analysis and factor loadings greater than .35 were considered significant, as this level of significance has previously been claimed as appropriate for sample sizes greater than 250 (Hair et al., 2006).

Factors with eigenvalues above 1.00 were extracted in line with Kaiser's (1958) criterion resulting in an 8 factor solution. Velicer's MAP test and parallel analysis (with the 95th percentile eigenvalues being estimated based on 1,000 datasets with permutation) were also conducted and both indicated a four factor solution. However, a PCA with a forced four factor solution did not logically fit the data, as a number of items did not load onto any factor and the face validity of the factors was greatly reduced. Therefore, the eight factor solution based on Kaiser's criterion was deemed more appropriate.

The internal consistency of the factors was examined using Cronbach's alpha (Cronbach, 1951). To examine construct validity Pearson's correlations were conducted between the factors and subscales of the SHC, and discriminant validity was assessed by conducting correlations between the factors and the PSS, HADs and PSQ.

Results

Factor Structure

The factor loadings are presented in table 2. Eight factors were extracted and accounted for 58.16% of the overall variance.

Due to the inconsistent nature of acute physical symptoms in the general population, there was evidence of overlap between the factors, however 'faintness' and 'feeling weak' demonstrated secondary 'cross loadings' (above .40) on 'sympathetic/cardiac symptoms' and 3 other items ('acne', 'poor appetite' and 'pulled ligaments') had secondary 'cross loadings' that exceeded .35. These items were included on the factor for which they demonstrated the highest loading. Inclusion of these items onto the factor for which they demonstrated the highest loading made conceptual sense and this approach improved Cronbach's alpha for the factors. The final 8 factors were identified and labelled as shown in table 2.

[Table 2 here]

Reliability

Cronbach's alpha for the 8 factors were; 'sympathetic/cardiac' symptoms (7 items) α= .827, muscular pain (6 items), α = .752, 'metabolic symptoms' (5 items) α = .736, 'gastrointestinal symptoms' (5 items), α=.714, 'vasovagal symptoms' (4 items), α=.743, 'cold/flu' (2 items) α=.837, 'headache' (2 items) α= .690, 'minor haemorrhagic symptoms' (2 items) α = .309. These values can be considered to represent acceptable or good internal consistency for all factors other than 'minor haemorrhagic symptoms'[1].

There were mainly small but significant correlations evident between the symptom

[1]. Although the internal consistency of the 'haemorrhagic symptoms' factor is low, we have not removed the items as we believe that it is important to consider all 33 items in the assessment of physical symptoms in the general population to obtain a complete picture of the type of symptoms individuals may report. It is however suggested that any users of the factor structure may wish to ignore the factor in their own analyses due to the low alpha level.

factors as can be seen in table 3. Moderate positive correlations (between .50 and .70) were demonstrated between 'sympathetic/cardiac symptoms', 'muscular pain', 'metabolic symptoms', 'vasovagal symptoms' and 'gastrointestinal symptoms'. Negligible and low positive correlations (.00-.30 and .30 - .50 respectively) were evident between the remainder of the factors.

[Table 3 here]

Construct Validity

To further establish construct validity, the factors identified were correlated with the 5 subscales of the SHC. As evident in table 4, high (>.70) significant positive correlations were demonstrated between the total scores on both scales (r= .722) and the 'cold/flu' factor of the CHIPS and the flu-like subscale of the SHC (r= .702) Moderate (.50-.70) significant positive correlations were demonstrated between the 'sympathetic/cardiac symptoms' and the pseudoneurology subscale of the SHC (r = .511), the 'muscular pain' factor and the musculoskeletal SHC subscale (r=.625), 'metabolic symptoms' and the pseudoneurology subscale (r=.660). Low significant positive correlations were evident between the pseudoneurology subscale and the 'vasovagal symptoms', and between the musculoskeletal subscale and both the 'headache' factor (r=.445) and 'minor haemorrhagic symptoms' (r =.375) factors.

[Table 4 here]

Discriminant Validity

Correlations were conducted between the derived factors and anxiety, depression, perceived stress, and pain sensitivity to assess the discriminant validity of the physical symptoms structure, see table 5.

[Table 5 here]

The majority of the factors showed negligible correlations (.00 - .30) with perceived stress, anxiety, depression and pain sensitivity, however; perceived stress demonstrated low positive correlations with ‘sympathetic/cardiac symptoms’, ‘vasovagal symptoms’ and ‘headaches’ and a moderate correlation with ‘metabolic symptoms’. Low (.30 - .50) positive correlations were also observed between anxiety levels and all factors apart from ‘cold/flu’ and ‘minor haemorrhagic symptoms’, and between depression levels and ‘metabolic symptoms’.

Discussion

The aim of the current study was to assess the internal factor structure of the Cohen-Hoberman Inventory of Physical Symptoms (CHIPS). This was proposed as necessary due to the frequency of subjective physical symptoms in the general population and the need for the assessment and differentiation of symptom clusters for research purposes. The eight factor solution that emerged showed generally good internal consistency (with the exception of the ‘minor haemorrhagic symptoms’ scale) and demonstrated similarities to the five factor solution of the SHC. The CHIPS does not include the additional scoring aspect of symptom duration that the SHC measures, however, its absence is not acknowledged as a limitation to the CHIPS, particularly as this aspect of the SHC scoring appears to accentuate the skewedness of the data (Eriksen et al., 1999).

Similarities were demonstrated between the SHC subscales and CHIPS factor solution, for example both scales contain factors pertaining to specifically gastrointestinal symptoms, cold and flu symptoms and musculoskeletal complaints. However, this is not surprising given these are very common physical symptoms (Ursin, 1997). Conversely, the CHIPS solution formed a separate coherent ‘headache’ factor whereas the migraines item was included in the musculoskeletal SHC subscale. Symptoms that were included in the pseudoneurological SHC subscale and other logically similar items separated out onto ‘sympathetic/cardiac’ (e.g. heart pounding/extra heartbeats), ‘vasovagal symptoms’ (e.g.

dizziness) and ‘metabolic symptoms’ (e.g. sleep problems) factors of CHIPS. Chest pain, which was included in the allergies subscale of the SHC was also more logically included in the ‘sympathetic/cardiac’ factor. Furthermore, the allergies subscale includes specific conditions such as eczema and asthma which, although may develop over the lifetime, tend to be specific to sufferers of the conditions. The CHIPS however, measures only general symptoms, all of which could potentially be suffered by any given individual within a healthy population.

From a theoretical perspective, due to the nature of subjective symptoms of physical health it is not surprising that significant correlations were observed between the individual factors. The largest associations are particularly noteworthy: between ‘vasovagal symptoms’ and both sympathetic/cardiac’ and ‘gastrointestinal symptoms’. Even though the latter two are logically and statistically distinct, they both overlap with some aspects of the ‘vasovagal symptoms’ factor. A few of the factors were also found to be weakly but significantly associated with measures of perceived stress and anxiety, adding further support to the burgeoning literature linking both of these elements of psychological well-being to physical health (e.g. Segerstrom & O’Connor, 2012). Furthermore, ‘metabolic symptoms’ were associated with levels of depression. It is well known that negative emotional states can lead to an increase in self-reported ill health. A plethora of research has linked poor health outcomes to higher indices of negative affect, and demonstrates that a physical decline in health can be accompanied by major depression (Penninx et al., 1999).

This study has also shown that the subjective distress from physical symptoms is only weakly associated with levels of pain sensitivity, suggesting that the number of health complaints people will report is not simply due to individual biological factors involved in tolerance to discomfort (Ruscheweyh et al., 2009). As levels of perceived stress and anxiety were found to be associated with some but not all of the factors it is evident that individual psychological and environmental concepts can play a role in the perception of one's physical symptoms. However, only some of the physical symptom factors were associated with these variables, which support the suggestion that examination of distinct symptom clusters may be particularly beneficial for research investigating links between psychological factors and ill health.

The proposed factor structure of the CHIPS could be particularly useful in research investigating the links between stress and health outcomes. For example research has found stress to be related to higher indices of gastrointestinal complaints (Whitehead, 1994) and flu symptomology (Smolderen et al., 2007). Furthermore due to the abundance of literature relating psychological morbidity (i.e. negative affectivity and depression) to physical health problems (e.g. Dua, 1994; Sullivan, LaCroix, Russo, & Walker, 2001), further research utilising this approach to self-reported symptoms may elucidate potential psychobiological mechanisms which may underpin these established health pathways.

Statistical analyses may be conducted on the resulting CHIPS scores for each symptom group but must be treated cautiously, particularly in healthy populations. Analyses using the 'minor haemorrhagic' factor scores are not recommended when utilising the proposed factor structure to define symptom clusters due to the poor internal consistency demonstrated in the current study. However, the definition of the factor and the items 'bruises ' and nosebleeds' have not been excluded from the measure as they can provide valuable data regarding individual's experiences of these symptoms, particularly as both are related to risks associated with the use of commonly used medicines such as Aspirin (Meade et al., 1992).

For many of the single items on the CHIPS, many people will not suffer or report any symptoms, and high numbers of zero scores may cause the resulting data to be highly positively skewed. However, in some research studies it could be useful to split groups based on total scores or individual symptom cluster scores (e.g. low, medium, and high levels of symptoms) and analyse the data categorically, or combine the scores with other measures of subjective physical symptoms.

It must be acknowledged that the sample of the general population utilised in this study comprised mainly of females residing in the UK, and therefore cannot be entirely generalisable. The number of females outweighed males approximately four-fold, which although is not unusual in online studies (Smith, 2008), and was a similar ratio to that of the paper detailing the SHC subscales (Eriksen et al., 1999), may present a source of potential bias. However, Eriksen et al., (1999) chose a combined gender analysis to represent their final factor structure, as it most closely matched that of their female sample. Therefore, although females tend to report more symptoms than males in general (Kroenke & Spitzer, 1998), it is suggested that there is little reason to believe clustering of symptoms may necessarily differentiate between genders. However, it is recommended that the unbalanced gender ratio is considered in interpretation of the current factor structure presented here, particularly if used with a larger proportion of male participants.

The self-administered nature of the CHIPS fundamentally brings with it the usual issues surrounding the use of self-report measures; however, although this may limit its use as a diagnostic tool, it may provide particularly valuable in research into individual differences in subjective health. The current study only postulates a potential factor structure, and it, may therefore, be beneficial to undertake confirmatory factor analysis to confirm the factor structure hereby presented. It may also be beneficial to seek further evidence for construct validity in different populations such as cross cultural and clinical samples, and in larger samples. With a validated factor structure researchers can consistently differentiate between symptom clusters and provide insights into specific aspects of self-reported ill health in the general population.

Conclusions

The CHIPS is a simple, inexpensive and practical tool for the quick assessment of the experience of physical symptoms, with a particular focus on the amount of subjective distress associated with each symptom, in the general population. The measure gauges the most frequently reported physical symptoms (Nixon et al., 2011) all of which have the propensity to be experienced throughout the population of otherwise healthy individuals, a particular advantage over the similar SHC inventory. The 33 items can be categorised into eight relatively distinct symptom-types of; ‘sympathetic/cardiac’, ‘muscular pain’, ‘metabolic’, ‘gastrointestinal’, ‘vasovagal’, ‘cold/flu’ ‘headache’ and ‘minor haemorrhagic symptoms’. All factors include conceptually similar items and with the exception of minor haemorrhagic symptoms demonstrate adequate internal consistency. The construct and discriminant validity of the factor structure has been examined and discussed. However, moving forward, further validity examinations and confirmatory analyses are warranted.

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Table 1. Participant demographics

		n
	Age (M, SD)	29.80 (±12.90)
Gender	Males	104
	Females	431
Employment status	Students	283
	Employed	223
	Retired/unemployed	29
Residency	UK	482
	Europe (non-UK)	13
	North America	18
	Australia	8
	Asia	9
	South America	3
	Africa	1
BMI	18- 25	345
	26-30	111
	31 +	68
Household income	£0-20k per year	213
	£20k+ per year	253
Total	N =	**535**

Table 2. Factor loadings for each of the 8 factors main items (factor loadings lower than .35 were suppressed)

	Rotation factor loading							
	Factor 1: Sympathetic/cardiac symptoms	Factor 2: Muscular pain	Factor 3: Metabolic symptoms	Factor 4: Gastro-intestinal symptoms	Factor 5: Vasovagal symptoms	Factor 6: Cold/flu	Factor 7: Headache	Factor 8: Minor haemorrhagic symptoms
Pains in heart or chest	.768							
Heart pounding or racing	.707							
Shortness of breath when not exercising or working hard	.648							
Hands trembling	.601							
Numbness or tingling in parts of your body	.573							
Blurred vision	.536							
Hot or cold spells	.431							
Muscle tension or soreness		.718						
Pulled (strained) muscles		.675						
Severe aches and pains		.642						
Muscle cramps		.620						
Back pain		.557						
Pulled(strained) ligaments		.532						.374
Sleep problems (can't fall asleep, wake up in middle of night or early in morning)			.692					
Weight change (gain or loss of 5 lbs. or more)			.604					
Feeling low in energy			.582					
Constant fatigue			.572					
Poor appetite	.368		.390					
Diarrhoea				.733				
Stomach pain				.624				
Acid stomach or indigestion				.596				
Constipation				.516				
Nausea				.498				
Dizziness	.397				.662			
Faintness	.425				.661			
Acne					.484		.354	
Felt weak all over	.451				.473			
Stuffy head or nose						.867		
Cold and/or cough						.846		
Migraine headache							.770	
Headache							.658	
Nosebleed								.657
Bruises								.495
Eigen values	9.246	1.985	1.705	1.552	1.313	1.228	1.159	1.005
Cronbach's α	*.827*	*.752*	*.736*	*.714*	*.743*	*.837*	*.690*	*.309*

Table 3. Pearson's correlations between the sum scores (n=535) of the individual factors

CHIPS factors		1. Sympathetic/cardiac symptoms	2. Muscular pain	3. Metabolic symptoms	4. Gastro-intestinal symptoms	5. Vasovagal symptoms	6. Cold/flu	7. Headache	8. Minor haemorrhagic symptoms
CHIPS factors	1. Sympathetic/cardiac	-	.523**	.561**	.552**	.631**	.223**	.390**	.319**
	2. Muscular pain		-	.474**	.413**	.464**	.122**	.363**	.240**
	3. Metabolic symptoms			-	.486**	.562**	.271**	.418**	.260**
	4. Gastro- intestinal				-	.601**	.248**	.372**	.253**
	5. Vasovagal symptoms					-	.285**	.448**	.335**
	6. Cold/flu						-	.262**	.157**
	7. Headache							-	.131**
	8. Minor haemorrhagic symptoms								-

(** =p<.001, * = p<.05)

Table 4. Pearson's correlations between the sum scores of the SHC subscales (n=534) and the CHIPS factors (n=535).

SHC subscales	CHIPS factors: 1. Sympathetic/cardiac symptoms	2. Muscular pain	3 Metabolic symptoms	4. Gastro-intestinal symptoms	5. Vasovagal symptoms	6. Cold/flu	7. Headache	8. Minor haemorrhagic symptoms	Total
Cold/flu	.156**	.077	.154*	.161**	.189**	.702**	.150**	.109*	.285**
Musculoskeletal	.321**	.625**	.365**	.267**	.301**	.148**	.445**	.375**	.512**
Pseudoneurological	.511**	.401**	.660**	.361**	.463**	.179**	.334**	.149**	.624**
Gastro- intestinal	.323**	.321**	.342**	.654**	.286**	.164**	.213**	.150**	.476**
Allergies	.447**	.318**	.301**	.293**	.322**	.162**	.204**	.272**	.439**
Total	.535**	.578**	.592**	.520**	.481**	.318**	.439**	.212**	.722**

(** =p<.001, * = p<.05)

Table 5. Pearson's correlations between the sum scores of the CHIPS symptom factors with scores on measures of perceived stress (PSS), anxiety, depression (HADs) and measures of pain tolerance (PSQ).

		CHIPS factors							
		1. Sympathetic/cardiac symptoms	2. Muscular pain	3 Metabolic symptoms	4. Gastro-intestinal symptoms	5. Vasovagal symptoms	6. Cold/ flu	7. Headache	8. Minor haemorrhagic symptoms
Discriminant factors	Perceived stress	.319**	.276**	.518**	.277**	.354**	.218**	.306**	.133**
	Anxiety	.434**	.355**	.566**	.327**	.421**	.167**	.328**	.192**
	Depression	.269**	.179**	.489**	.196**	.283**	.119**	.156**	.053
	Minor pain sensitivity	.115**	.106*	.113*	.050	.087*	.076	.118**	.055
	Moderate pain sensitivity	.102*	.092*	.101*	.082	.077	.120**	.112*	.037
	Total pain sensitivity	.121**	.110*	.110*	.069	.094*	.103*	.126**	.035

(** =p<.001, * = p<.05)