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The Factor Structure of the Illness Attitude Scales in A German Population

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Abstract
Background The illness attitudes scales (IAS) were developed to identify different dimensions of hypochondrical attitudes, fears, beliefs, and abnormal illness behavior (Kellner 1986). Although there are several studies which focus on the scale structure of the IAS, the factor structure has not yet been made quite clear.
Purpose Therefore, the aim of this study was to investigate the factor structure of the IAS on a large representative sample.
Method Participants (N=1,575) comparable with the general German population regarding sex, age, and education level completed the IAS. For the data analyses, a principal components analyses with subsequent oblique rotations was used.
Results The minimum average partial method suggested a three-factor solution. The three factors were named (1) health anxiety, (2) health behavior, and (3) health habits. Internal consistency (Cronbach's alpha) for the three scales were (1) α=0.88, (2) α=0.75, and (3) α=0.56.
Conclusion The results support previous findings, namely that the IAS factor structure appears to be less complex than originally suggested by the author. For a sample of the general German population, a three-factor solution fit best. Further items should be added to improve the internal consistency, especially for the third scale (health habits).

Keywords Hypochondriasis · Illness attitude scales · Measurement · General population · Scale structure

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Introduction

Hypochondriasis is defined as a preoccupation with the fear of having a serious disease based on the person's misinterpretation of bodily symptoms [2]. Escobar et al. [3] estimated the prevalence of hypochondriasis in primary care at 3.4%. In a representative sample of the general population, 13.1% reported at least a period of 1 month of intensive worrying about a serious illness [4]. Hypochondriasis and illness worry is associated with enhanced costs to the health care system (e.g. [5]). A couple of self-report measures were developed to measure hypochondriacal attitudes, fears, beliefs, and abnormal illness behavior. One of the most commonly used instruments is the illness attitude scales (IAS) developed by Kellner [1]. The IAS demonstrated their reliability and validity in several studies [6–9] and are currently the gold standard for the self-rated assessment of hypochondriacal attitudes [10]. They consist of 29 items. Twenty-seven items are to be rated on a five-point scale from 0 to 4 (no, rarely, sometimes, often, and most of the time). Two open-question items on the IAS (item 22 and item 26) deliver additional information specifying illnesses and treatment. Concerning the factor structure of the IAS, different results were discussed. The original version of the IAS was constructed to include nine a priori scales [1]: (1) worry about illness, (2) concerns about pain, (3) health habits, (4) hypochondriacal beliefs,

(5) thanatophobia, (6) disease phobia, (7) bodily preoccupations, (8) treatment experiences, and (9) effects of symptoms. Empirical research has found a different factor structure of the IAS and suggests a smaller number of factors. Table 1 gives an overview of the studies which focus on the factor structure of the IAS. These studies differ with respect to examined population, number of participants, methodological differences, and number of founded factors. All studies used a principal components analysis (PCA) for factor extraction.

Three studies found a five-factor solution for the IAS [11–13]. All authors used a parallel analysis (PA) for the extraction of the factors [14]. In addition, Cox et al. [11] conducted a second PCA using the five IAS factor scores in order to determine whether the IAS factors could load onto one or more higher order hypochondriasis factors. They found a higher order two-factor solution indicated by the Kaiser criterion (eigenvalue>1) and by visual inspection of the scree plot. The factors were named (1) heath anxiety and (2) health behaviors.

Three investigations found a four-factor structure for the IAS [15–17]. For the extraction of the factors, all studies used a PA. In addition, Crössmann and Pauli [15] used the minimal average partial method (MAP) [18, 19]. They analyzed two samples and found a four-factor solution for a sample of 296 students. Stewart and Watt [17] tested for a higher order factor and identified one higher order factor by conducting a second PCA on the four factors; it was named "general hypochondriacal concerns."

Only Dammen et al. [20] found a three-factor solution. The authors analyzed a sample consisting of 199 cardiological outpatients.

Four studies prefer a two-factor solution. All of these studies analyzed samples of patients [15, 21, 22]. Additionally, Speckens et al. [22] examined a sample of 204 subjects from the general population. The authors also found a two-factor solution for this sample.

All investigations suggest that the factor structure of the IAS is less complex than the one proposed by the author [1]. But it is uncertain which factor structure is most appropriate. The differences in the results of the studies above can be explained by differences in the methods and samples. Some studies [20–22] only used the Kaiser criteria (eigenvalues>1) and the scree test for the extraction of the factors. These methods are thought to be potentially unreliable [23]. Other studies [11, 13, 16, 17] only examined selective samples of students and were not representative of the general population.

Most investigations which analyzed samples of patients suggest a two-factor solution [15, 21, 22]. Only two studies analyzing a patient sample [12, 20] deviated from a two-factor structure; one study suggested three dimensions of the IAS, while the other suggested five. However, these studies examined a very specific sample of patients with physical pain. This circumstance could be an explanation for the differing results. The other investigations, which focused on non-patient samples, analyzed student samples and found more than two dimensions [11, 13, 15–17]. Only Speckens et al. [22] analyzed a sample of 204 participants of the general population and found a two-factor solution, but they did not use appropriate statistical methods.

There is not one study which analyzed the factor structure of a general population by using optimal statistical methods, like the PA or the MAP. Investigations of the scale structure of the IAS in samples from the general populations are very important if the IAS are to be used for the screening in general populations. Such investigations are also necessary for studies of subclinical health anxieties in general populations. Therefore, the aim of this study was to investigate a representative sample of the German population with appropriate statistical methods in order to determine the scale structure of the IAS.

Method

Participants

Two thousand one hundred ninety-eight participants were originally assessed for an epidemiologic study about hypochondriasis and health anxiety in the German population [24]. Inclusion criteria were: residence in Germany, sufficient language ability, and a minimum age of 18. The majority of the subjects were assessed in the Rhine-Main region. Data collection was carried out by a group of eight trained psychology students from March until May 2002. Participants were asked to participate in a study on the health beliefs of the German population by filling out a short questionnaire.

Recruitment took place in nine different areas among employees and workers (28.0%), music associations (19.4%) and sports clubs (13.5%), by front-door questioning in a district chiefly inhabited by the lower class (10.1%), different schools for all levels of education (8.5%), means of public transportation (6.8%), several clubs and two homes for the elderly (6.7% and 3.6%, respectively), and in a furniture shop (3.4%). One thousand five hundred seventy-five participants were selected by socio-demographic representation criteria of the German community concerning age, sex, and level of education. Table 2 gives an overview of the socio-demographic data of the participants and the German population found by the German Federal Statistical Office [25]. There are no differences between the German population and the sample in terms of sex (χ^2=0.05; df=1; p>0.10), age (χ^2=0.43; df=7; p>0.10), or education level (χ^2=6.47; df=3; p>0.05).

Table 1 Studies which examined the factor structure of the IAS

	Ferguson and Daniel [16]	Speckens et al. [22]	Hadjistavropoulos and Asmundson [12]	Dammen et al. [20]	Hadjistavropoulos et al. [13]	Stewart and Watt [17]	Cox et al. [11]	Hiller and Rief [26]	Crössmann and Pauli [15]
Sample	101 students	130 general medical outpatients; 113 general practicepatients; 204 general population subjects	198 chronic pain patients	199 patients with chest pain	390 students	197 students	309 students	570 patients with mental and psycho-physiological disorders	296 students/130 psychosomatic patients
Language	English	Dutch	English	Norwegian	English	English	English	German	German
Factor analysis	PCA	PCA	PCA	PCA	PCA	PCA	PCA	PCA	PCA
Method for factor extraction	Parallel analysis	Eigenvalues>1; scree test	Parallel analysis	Eigenvalues >1; scree test	Parallel analysis	Parallel analysis	Parallel analysis; eigenvalues >1	Eigenvalues>1; interpretability of the factor structure	Parallel analysis; average partial method
Number of factor	4	2	5	3	5	4/1	5/2	2	4/2
Rotation	Varimax	?	Oblimin	Varimax	Oblimin	Oblimin	Oblimin	Varimax	Oblimin
Explained variance	47.1%	37%/32%/38%	52.4%	47.0%	52.3%	53.9%/44.3%	56.4%/57.1%	?	46.3%/38.3%
Scale 1	Hypochondriacal fears and beliefs	Health anxiety	Fear of illness	Health anxiety	Fear of illness, death, disease and pain	Fears of illness, death, disease and pain/ general hypochondriacal concerns	Fear of illness and death/ health anxiety	Health anxiety	Fear of illness and death/ health-related anxiety
Scale 2	Symptom experience and frequency of treatments	Illness behavior	Effects of symptoms	Illness behavior	Effects of symptoms	Health-promoting behavior	Treatment experience/ health behaviors	Illness behavior	Treatment experience/effect of symptoms and treatment experience
Scale 3	Thanatophobia		Health habits	Health habits	Treatment experience	Hypochondriacal beliefs and disease conviction	Effects of symptoms		Hypochondriacal beliefs
Scale 4	Fear of coronary heart disease and associated health habits		Disease phobia and conviction		Disease conviction	Detrimental effects of bodily symptoms on conviction overall functioning	Disease phobia and conviction		Effect of symptoms
Scale 5			Fear of death		Health habits		Health habits		

PCA principal components analysis

Table 2 Demographic characteristics of our sample and the German population

Population[a]	Sample (*N*=1,575) (%)	German (*N*=67,771,500) (%)
Sex (female)	51.2	51.6
Age		
18–24	10.0	10.0
25–34	16.6	14.7
35–44	20.2	20.6
45–54	16.6	17.5
55–64	16.2	14.2
65–74	11.8	13.2
>74	8.6	9.8
Educational level[b]		
Without graduation or currently in school	1.2	8.2
Hauptschule (completed junior high school)	38.4	41.6
Realschule (completed high school)	33.5	26.8
Fachhochschule or Hochschule (qualification for university entrance)	26.9	22.4

[a] Data from the German Federal Statistical Office [25]

[b] The German schooling system is not directly comparable with the American system, but near correspondents are given in parentheses

The mean score of all IAS items in the current sample was M=1.18 (SD=0.51). In comparison, Hiller et al. [21] found a mean score of M=2.25 (SD=.65) for hypochondriacs, M=1.56 (SD=0.59) for patients with a somatoform disorder, and M=1.43 (SD=0.63) for clinical controls. In the general population [22], the mean score of all IAS items which were included in the subscales (health anxiety and illness behavior) were M=1.61 (the SD of all items was not reported by the authors).

Instrument

Participants filled out the German version of the IAS. The German version of the IAS, developed by Hiller and Rief [26], has demonstrated its reliability and validity. Coefficient alpha for internal consistency was 0.90 for the overall scale. The test–retest reliability of the overall scale lies between r_{tt}=0.89 (30-day retest interval) and r_{tt}=0.92 (50-day retest interval) [26]. Concerning the validity, the IAS show correlations to other measures which are associated with hypochondriasis and clearly discriminate between hypochondriacal and non-hypochondriacal patients [21].

Statistical Analysis

An exploratory PCA was conducted to analyze the factor structure of the IAS. The application of an oblique rotation is recommended by a factor correlation above 0.15 (e.g. [27]). The previous studies on the factor structure of the IAS show that correlations above 0.15 are to be expected. Because we also anticipate a dependent factor structure for the present data, we chose an oblique rotation (Oblimin, δ=0). To determine the number of factors, we chose a parallel analysis [14, 28]. By this method, the eigenvalues which were extracted from the empirical data were compared to the means and 95th percentiles of the eigenvalues which were extracted from normally distributed random data. Only when the ith eigenvalue from the actual data was greater then the ith eigenvalue from the random data was the factor retained. In addition, we used the MAP [19, 29] for the extraction of the factors. The MAP method focuses on the relative amounts of systematic and unsystematic variance remaining in a correlation matrix after extractions of increasing numbers of components. The calculation of parallel analyses and the MAP method were carried out following the suggestion made by O'Conner [18]. For the MAP method, the revised version from Velicer et al. [29] was used. To construct the subscales, we accounted only for items which had a factor loading >0.40.

Results

The eigenvalues for the first ten components were 7.08, 2.06, 1.83, 1.34, 1.22, 1.72, 1.11, 1.02, 0.89, and 0.83. Using the eigenvalue>1 criterion, eight factors would remain. The scree test, which was only used for a rough orientation, suggested a three-factor solution (accounting for 40.6% of the variance). The MAP method suggested a three-factor solution as well. But the parallel analysis suggested a six-factor solution (accounting for 54.5% of the variance). Due to this ambiguity, the scale structures of the three- and six-factor solutions were examined using an oblique rotation (Oblimin, δ=0). The six-factor solution was difficult to interpret. An explicit factor loading on one

factor was not found for eight items. The three subscales are named as follows: (1) health anxiety (16 items), (2) illness behavior (six items), and (3) health habits (four items). Only one item (item 11) had no significant factor loading on any factor and was therefore excluded. Item 5 showed a relatively high factor loading on two factors, but we decided to assign the item to the subscale "health habits" because the factor loading was slightly higher on this factor (illness behavior=0.32 vs. health habits=0.42). All other items exhibit a clear affiliation to just one factor. The factor loadings ranged from 0.40 to 0.72 (see Table 3). The correlations among the three factors ranged from 0.14 to 0.36. The internal consistencies of the IAS subscales were measured by Cronbach's alpha coefficient and were as follows: health anxiety α=0.88, illness behavior α=0.75, and health habits α=0.56.

A second principal components analysis was performed on the three established IAS factor scores to identify higher order IAS dimensions. The eigenvalues for the three components were 1.64, 0.82, and 0.54. Using the eigenvalue>1 criterion, only one factor would remain. The parallel analysis and the MAP method also suggested a one-factor solution. The factor loadings were 0.81 (health anxiety), 0.80 (illness behavior), and 0.60 (health habits). The higher order solution accounted for 54.5% of the variance of the subscales and was named "general hypochondriacal concerns." The internal consistency of the higher order factor (including 26 items) measured by Cronbach's alpha was α=0.87.

Table 3 Results of the PCA with oblique rotation (Oblimin, δ=0)

	F1	F2	F3
Health anxiety			
1. Do you worry about your health?	0.54	0.15	0.18
2. Are you worried that you may get a serious illness in the future?	0.66	−0.03	0.19
3. Does the thought of a serious illness scare you?	0.62	−0.03	0.10
4. If you have a pain, are you concerned that it may be caused by a serious illness?	0.61	0.10	0.20
6. If a pain lasts a week or more, do you believe that you have a serious illness?	0.55	0.09	0.21
10. Do you believe that you have a physical disease but the doctors have not diagnosed it correctly?	0.40	0.20	−0.07
12. When you have been told by a doctor what he found, do you soon begin to believe that you may have developed a new illness?	0.52	0.12	−0.09
13. Are you afraid of news which remind you of death (such as funerals or obituary notices)?	0.71	−0.15	−0.10
14. Does the thought of death scare you?	0.66	−0.16	−0.08
15. Are you afraid that you may die soon?	0.72	−0.05	−0.09
16. Are you afraid that you may have cancer?	0.71	−0.09	−0.01
17. Are you afraid that you may have heart disease?	0.55	0.02	0.07
18. Are you afraid that you may have another serious disease?	0.61	0.11	0.01
19. When you read or hear about an illness, do you get symptoms similar to those of the illness?	0.50	0.04	−0.07
20. When you notice a sensation in your body, do you find it difficult to think of something else?	0.43	0.20	0.01
21. When you feel a sensation in your body, do you worry about it?	0.53	0.09	0.14
Illness behavior			
23. How often do you see a doctor?	0.02	0.60	0.32
24. How many different doctors, chiropractors, or other healers have you seen in the past year?	−0.04	0.51	0.21
25. How often have you been treated during the past year? (For example, drugs, change of drugs, surgery, etc.)	−0.10	0.66	0.16
27. Do your bodily symptoms stop you from working?	0.10	0.65	−0.19
28. Do your bodily symptoms stop you from concentrating on what you are doing?	0.20	0.70	−0.28
29. Do your bodily symptoms stop you from enjoying yourself?	0.21	0.70	−0.27
Health habits			
5. If a pain lasts for a week or more, do you see a physician?	−0.04	0.32	0.42
7. Do you avoid habits that may be harmful to you such as smoking?	−0.03	−0.07	0.71
8. Do you avoid foods that may not be healthy?	0.01	−0.09	0.72
9. Do you examine your body to find out whether there is something wrong?	0.20	0.06	0.49
Not included in subscales			
11. When your doctor tells you that you have no physical disease, do you refuse to believe him?	0.06	0.01	0.15

Discussion

This study analyzed the factor structure of the IAS in a German population. Currently, this investigation has the largest sample (N=1,575) for the determination of the factor structure of the IAS. The results suggest that the structure of the IAS in the general population is best explained by a three-factor solution. The three subscales were named (1) health anxiety, (2) illness behavior, and (3) health habits. The results support past findings [11–13, 15–17, 20–22] which indicate that the factor structure of the IAS seems to be less complex than the one proposed by Kellner [1]. The three-factor solution found is in consensus with the findings from Dammen et al. [20]. Dammen et al. [20] also found three subscales with a comparable assignment of the items to the subscales.

We chose an exploratory analysis to examine the factor structure of the given data; it was also possible to conduct a confirmatory analysis. A confirmatory analysis is adequate if we have a theoretical model or an approved factor structure we would like to test. But we decided on an exploratory analysis for the following reasons: (1) The theoretically assumed nine-factor structure was not found in previous studies. Therefore, no evidence was given for the theoretical a priori scale structure suggested by Kellner. (2) Previous studies found no consistent factor structure for the IAS. Even though studies found the same number of factors, the factor scale assignments were not the same. (3) Only one study examined the scale structure of a smaller sample of the general population [22]. Therefore, not much is known about the scale structure in a general population. (4) Few studies used proper statistical methods for the extraction of the factors. An investigation of the general population [22] only used the eigenvalue>1 rule and the scree test.

Each of the different methods employed for the extraction of factors (PA and MAP) suggested a different number of factors: the PA suggested six factors; the MAP method and the scree test suggested only three. The six factor solution was difficult to interpret. For one scale, it was not possible to assign any items. For these reasons, the six-factor solution seems inadequate. In comparison, the three-factor solution was more easily interpretable. Concerning the factor structure, only the three-factor solution generated an interpretable result. Therefore, only the MAP method was taken into account and the three-factor solution was chosen. The three-factor solution explained 40.6% of the variance of the sample. This is comparable to the variance explained by two-factor solutions [15, 22]. But it is less than the one found for the three-factor solution by Dammen et al. [20], which was 47.0%. The four- [15, 17] and five-factor [11–13] solutions also accounted for more variance (47.1% to 56.4%). In comparison, less variance was explained in the present study than in previous studies. One possible reason for this result is that we were able to integrate more items than the previous studies. Only one item was excluded. On the one hand, this shows that the three-factor solution fits well; on the other hand, the integration of more items leads to a reduction of explained variance.

Only one item was excluded from the subscales (item 11), which showed that the three-factor solution seems to be very suitable for the data. The exclusion of a significant factor loading for item 11 was also found in previous studies, which use the German translation of the IAS [15, 21]. Item 11 is formulated as a double negation and is hard to understand. Only in a sample of students where the level of education is higher did item 11 show an explicit loading onto a single factor [15]. We therefore propose to reformulate item 11 in the German version of the IAS if further investigations should use this item at all.

Item 5 had relatively high factor loadings on the subscales “illness behavior” (0.32) and “health habits” (0.42), so subscale assignment for this item needed to be taken into consideration. Item 5 asks about whether or not a physician is sought when pain lasts for a week or more. Even if medical consultation counts as a type of illness behavior, it seems to be more appropriate to describe it as a rule or habit: every time one has a physical problem that lasts longer than a week, one goes to the doctor. For this reason, as well as the higher factor loading, we decided to assign item 5 to the subscale “health habits.”

The three subscales (health anxiety, illness behavior, and health habits) were also suggested in previous studies which investigated the dimensions of the IAS. The subscales “health anxiety” and “illness behavior” were consequently named (or similarly named) in each study [11–13, 15–17, 20–22]; however, even these studies differ according to item factor assignments. The subscale “health habits” was suggested in five of nine studies [11, 12, 16, 20]. This circumstance is an indicator of the importance of this subscale in connection with the factor structure of the IAS.

An analysis for a higher order factor structure suggested a higher order factor solution. The higher order factor has a high reliability and was named “general hypochondriacal concerns.” A higher order factor structure was also tested for in two other studies: Cox et al. [11] found a two-factor higher order structure accounting for 57.1% of the variance, and Stewart and Watt [17] found a one-factor higher order factor structure accounting for 44.3% of the variance. The one-factor higher order factor structure found in the present study explained 54.5% of the variance of the subscales, which is more than for the one-factor solution from Stewart and Watt [17] and only slightly fewer than for the two-factor solution found by Cox et al.

[11]. Therefore, the present one-factor solution presents an adequate solution.

The internal consistency (Cronbach's alpha) of the subscales were 0.88 (health anxiety), 0.75 (illness behavior), and 0.56 (health habits) and are comparable to the study by Dammen et al. [20]. The first scale "health anxiety" consists of 16 items and shows the highest internal consistency. The second scale "illness behavior" consists of six items, and the third scale "health habits" consists of four items. It seems likely that the lower internal consistencies of the two subscales (illness behavior and health habits) depend on the lengths of the scales. This seems to be the case especially for the third scale (health habits), as no previous study found a satisfying internal consistency. Previous findings ranged from 0.49 to 0.66 [12, 13, 20]. Another possible reason for the lower consistency of the scale "health habits" is that two items of the scale (items 5 and 9) have a relatively low factor loading. The formulation of the question could be a reason for this relatively low loading on the third factor. If the participants were asked about regular visits to a physician or regular bodily examinations, a higher factor loading would be likely.

The unequal number of items for the different subscales is a shortcoming which was also found in previous investigations. Studies always suggested a strong first factor, most often named "health anxiety"; further factors often consist of fewer items. The a priori scale structure of the IAS [1] distributed the items evenly between the subscales, with three items per subscale, but this could not be confirmed in empirical research. A further development of the IAS seems to be necessary to represent substantial subscales with an adequate number of items. Therefore, more items should be added, especially to the last two subscales, in order to improve the reliability of these scales. A further consideration is to also reduce the first subscale (health anxiety) in order to produce a more balanced instrument which can give more extended information about hypochondriacal concerns.

One restriction of the present study is that the sample was not randomly selected and that therefore a selection bias is possible. For example, 13.5% of the participants were recruited from sports clubs. It is possible that physically active individuals have lower levels of health-related anxieties. An indication for this is the slightly lower mean score of the IAS items in the present study in comparison with the study of Speckens et al. [22]. The two-factor solution with the dimensions "health anxiety" and "illness behavior" seems to be, at present, the most suitable for clinical populations. For investigations of patients with mental disorders, the two-factor solution should be taken into consideration. Probably, if items were added to the scale "health habits," a three-factor solution could be found for clinical populations as well.

Because previous studies used different methods and investigated different samples, the results are difficult to compare with the present results. Only one study [15] used the MAP method to determine the number of factors. But the samples were different from those in our study. Crössmann and Pauli [15] found a two-factor solution for a sample of psychosomatic patients and a four-factor solution for a sample of students. Only Speckens et al. [22] investigated a sample of the general population as we did and suggested a two-factor solution, but they did not use optimal statistical methods.

Further investigations are necessary for the validation of the three subscales. Several questions remain unanswered: Are all subscales able to differentiate between hypochondriac patients and healthy controls? Are the subscales useful for the differential diagnostic of hypochondriasis and anxiety disorders? These and other questions, which focus on the validity of the IAS, can only be answered if the suggested subscales are used in further clinical studies.

Nevertheless, the IAS are one of the most suitable instruments when screening for hypochondriasis [30]. At this point, our study is the largest investigation involving a general population. If the IAS should be used in a sample of the general population, it seems better to utilize the three-factor solution we found. But further empirical investigations in general populations using comparable statistical methods are necessary to confirm this suggested solution for the general German population.

Conclusion

In comparison to past studies, ours is the largest investigation of the scale structure of the IAS in a representative population sample. The result of the present study suggests a three-factor structure of the IAS in general populations. Further investigations in representative samples are necessary to confirm the results. An improvement of the scale "health habits" should be one aim of further investigations.

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