

Clustering Somatic Symptoms Based on Psychological Risk Factors

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Abstract

Objective: Somatic symptoms consist of a wide range of symptoms and until yet clustering them has been very challenging for researchers and therapists. The present study aims to explore underlying psychological factors of various functional somatic symptoms and determine if there are any similarities or differences in these factors that could help classify these symptoms as one syndrome or discrete ones.

Method: This study adopted an association rule mining method based on data mining. 643 participants were recruited using a convenience sampling technique. Data were collected using the checklist of somatic symptoms (Lacourt et al., 2013), Attachment Questionnaire (Hazan & Shaver, 2017), Defense Style Questionnaire (Andrews et al., 1993), and Levels of Emotional Awareness Scale (Lane, 2006).

Results: Cognitive, gastrointestinal, and fatigue symptoms are related more to immature defense mechanisms. Musculoskeletal, respiratory, and cardiac symptoms are associated with neurotic defenses. Fatigue symptoms are associated with ambivalent attachment and musculoskeletal symptoms are related more to avoidant attachment. Indeed, it could be said that there are two clusters of somatic symptoms, one of which is attachment and the other is defense mechanisms. This supports the splitters' view about somatic syndromes.

Conclusions: These findings show various types of somatic symptoms have qualitatively different risk factors. Our findings imply that psychotherapists should consider the kind of syndromes a patient has and their underlying psychological predispositions to manage the problem better.

Keywords: Clusters, Functional Somatic Symptoms, Defense Mechanisms, Attachment style, Level of Emotional Awareness

Introduction

Functional somatic syndromes are one of the most debilitating and widespread problems in the medical systems that consume many resources (Jadhakhan, Romeu, Lindner, et al., 2022; Rief & Martin, 2014). The underlying mechanisms of these symptoms are very enigmatic and most of the time they are difficult

to treat (Schröder, Ornbol, Jensen, Sharpe, & Fink, 2017). These symptoms are made up of various types of somatic symptoms including bone pain, muscular pain, reproductive-urinary problems, skin disorders, migraine headaches, dizziness, excessive fatigue, memory impairment, difficulties in concentration, shortness of breath, chest pain, abdominal pain, nausea, vomiting, insomnia, etc. (Kitselaar, Van Der Vaart, Perschl, et al., 2023; Lacourt, Houtveen, & van Doornen, 2013).

The clustering of these diverse symptoms has historically challenged researchers (Lacourt et al., 2013; Sattel et al., 2023). Medical specialists have

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tried to cluster these symptoms based on bodily organs that are affected and labeled a symptom or group of symptoms based on their specialty as Functional Somatic Syndromes (FSS) or Medically Unexplained Syndromes (MUS) such as Chronic Pain Syndrome (CPS) (fibromyalgia), Chronic Fatigue Syndrome (CFS), Irritable Bowel Syndrome (IBS), non-cardiac chest pain and so on (Berezowski, Ludwig, Martin, Löwe, & Shedden-Mora, 2022; Monden, Rosmalen, Wardenaar, & Creed, 2022; Wessely, Nimnuan, & Sharpe, 1999). On the other hand, psychosomatic researchers have tried to cluster these symptoms based on statistical relationships of symptoms (Lacourt et al., 2013). These studies have led to the lumpers-splitters challenge. The lumpers are those researchers who believe there is only one functional somatic syndrome which could include various somatic symptoms. They think so because all symptoms share common risk factors and similar childhood traumas and there is a significant overlap between the symptoms in syndromes (Aggarwal, McBeth, Zakrzewska, et al., 2006; Kitselaar et al., 2023). The splitters claim the diversity of somatic symptoms in the defined syndromes is not that small to be ignored and various syndromes are made up of different somatic symptoms (Lacourt et al., 2013). Statistical methods are being used to find similarities and specificities of all types of somatic symptoms that make separate somatic syndromes. This led to variant and inconsistent numbers and types of somatic syndromes in different studies (Huang, Chang, & Liao, 2022).

Huang et al. (2022) showed common somatic symptoms could be clustered according to their somatic features as “high pain-fatigue and comorbid somatic symptoms”, “high gastrointestinal symptoms”, “middle to high pain-fatigue symptoms” and “high cardiovascular symptoms”. Shabbeh, Feizi, Afshar, et al. (2016) found 4 groups of somatic symptoms, including mental, gastrointestinal, respiratory, and

general symptoms in both men and women. Tsai (2010) separated the symptoms into four categories: pain, gastrointestinal, cardiopulmonary, and cold. Fink et al. (2005) found 4 significant categories of somatic symptoms including gastrointestinal, cardiopulmonary, musculoskeletal, and general. Nimnuan, Hotopf, and Wessely (2001) classified somatic symptoms into 5 groups: sleep problems, neurological mood, general pain, cardiorespiratory, and fatigue. As we mentioned earlier, one problem is that there is no consensus in these studies and each of them introduces different numbers and types of somatic symptom groups, and there are various categories of symptoms or related syndromes that complicate the challenge of clustering somatic symptoms (Nimnuan, Hotopf, & Wessely, 2001; Tsai, 2010).

Another problem in these clustering methods is that in most studies, a group of heterogeneous symptoms emerges, named “other symptoms” or “general symptoms”. This group includes gastrointestinal, musculoskeletal, cognitive, respiratory, pain, and mental symptoms (Lacourt et al., 2013). Therefore, both mentioned clustering methods including those syndromes defined by medical specialists and the ones that are the results of statistical analyses are based on the associations between bodily symptoms in patients, and as we have speculated, these symptoms had not been clustered based on the etiological factors such as underlying psychological risk factors.

Recently, Huang et al. (2022) showed that a cluster of high-pain-fatigue and comorbid somatic symptoms are associated with depression and anxiety. But there are underlying psychological factors such as emotion regulation strategies, attachment styles, ego strength, cognitive functions, and personality traits for both anxiety and depression that need to be explored and their role in different somatic symptoms must be addressed. Previous studies have

shown psychiatric disorders could be classified based on their underlying psychological factors. For instance, depression could be classified as introjective and anaclitic depression which are related to self-definition and relatedness needs of our psyche (Kalamatianos & Canellopoulos, 2022; Reis & Grenyer, 2002). Also, anxiety could be classified as persecutory and guilt anxiety based on the level of personality organization (Govrin, 2022). It is well known that these symptoms with different psychological risk factors respond to various interventions (Hennissen et al., 2019). However, other psychiatric symptoms have not been clustered based on these psychological factors and only general associations have been demonstrated that show different psychological risk factors play a major role in all of these symptoms.

The relationship between these psychological factors and different somatic symptoms has been studied in general and all studies show the role of these factors in predisposing individuals to somatic symptoms. However, no study has been conducted on the relationship between specific psychological factors and various somatic symptoms, and it is not clear if different psychological characteristics predispose individuals to different somatic symptoms. This gap in the classification of somatic symptoms and related disorders hampers understanding and treatment of these symptoms and could be the reason that all of these symptoms do not respond to the same treatments (Berezowski et al., 2022).

The purpose of this study is to address this gap to determine the association between different psychological factors and somatic symptoms and cluster these symptoms based on psychological commonalities, not just medical similarities or statistical convergences. The implication of findings will be important in understanding and treating these symptoms because symptoms with different psychological risk factors may respond to

psychological and medical interventions.

Another predicting factor we used was levels of emotional awareness. The literature on somatic symptoms is filled with studies that demonstrate the role of emotion regulation problems specifically alexithymia or having words for our emotions as the major risk factor for all types of somatic symptoms (Afshari & Mir Mohammadi, 2019; McHugh & Egan, 2023). However, several studies have shown that the alexithymia scale is not a valid tool to assess this capacity. We chose the levels of emotional awareness scale to address this challenge. In particular, the difference between the capacity of understanding self-focused emotions and other-focused emotions is not illustrated in alexithymia research and their relationship with somatic symptoms is still unclear (McHugh & Egan, 2023).

Method

Participants and Procedure

To obtain data from the general population we used online questionnaires. Our questionnaires were uploaded to the most popular social networks in Iran including Instagram, Telegram, Eitaa, Twitter, and WhatsApp. About one million people saw our requisition to fill out the questionnaires. Finally, 643 participants who had filled out questionnaires completely with valid answers to open questions were selected. To control cultural effects inclusion criteria were being a resident of the capital city of Tehran. Other inclusion criteria were: not beginning medical treatments with severe side effects or having severe accidents in recent months. The exclusion criteria included not completely answering the questions.

Ethical statement

Regarding ethical considerations, the present study has been approved by the research committee of Tarbiat Modares University. Also, online informed

consent was obtained from all the research participants.

Measures

Checklist of somatic symptoms: We used the Lacourt somatic symptoms checklist (Lacourt et al., 2013). This checklist has 47 items and the response on single items is on a five-point Likert scale (range 1–5) with higher responses indicating higher symptom burden (1=not; 2=a little; 3=quite a bit; 4=quite a lot; 5=highly). This checklist consists of four gastrointestinal symptoms, five respiratory symptoms, six cardiac symptoms, six musculoskeletal symptoms, six physical fatigue symptoms, six cognitive symptoms, and fourteen ‘other’ symptoms such as headache. The face validity of the translated questionnaire was checked by two specialists and Cronbach’s alpha coefficient was 0.94.

Hazan and Shaver Attachment Questionnaire (AQ): AQ is a brief instrument to measure attachment patterns in adults. It has 15 items which are on a five-point Likert scale (1 = very little to 5 = very much). (Hazan & Shaver, 2017) assumed that attachment is a stable way of communicating with significant others in childhood and in later life, it defines affectionate relationships. This means that a person’s attachment style can be determined by analyzing his/her close relationships. Adults are classified as being either securely, avoidantly, or ambivalently attached. Adequate reliability and validity of the Persian form of this short measure have been previously confirmed in Iran (Besharat, 2011). Internal validity of this questionnaire has been reported as 0.84 and 0.85; Test-Retest reliability was 0.83 and 0.84 for avoidant and ambivalent attachment styles, respectively (Besharat, 2011). The Cronbach’s alpha coefficient of ambivalent and avoidant attachment styles was 0.90 and 0.87 in our study.

Defense Style Questionnaire (DSQ): The DSQ has

40 items scaling in a 9-degree Likert. The three-factor structure of the DSQ corresponds to mature (8 items), immature (24 items), neurotic (8 items), and defense styles. 20 defense mechanisms are evaluated and individual defense scores are calculated as the mean between the two items corresponding to each defense mechanism (Schauenburg, Willenborg, Sammet, & Ehrental, 2007; Andrews et al., 1993). Test-retest reliability has been 0.82 for Iranian samples. The Cronbach’s alpha was 0.74, 0.75, and 0.73 for the questions of each neurotic, mature, and immature style in the Persian version (Heidari Nasab, Mansouri, Azadfallah, & Shaieeri, 2007).

Levels of Emotional Awareness Scale (LEAS): LEAS includes 20 scenarios and each scenario involves self and another person. These scenarios are meant to evoke basic and ambivalent emotions and the participant is asked to determine how he/she or the other person feels in each scenario. Subjects must answer, “How would you feel?” and “How would the other person feel?” Each scenario depending on the degree of differentiation in using emotional words and differentiating self-emotions from others receives a score of 0–5. A LEAS score of 1 indicates that bodily sensations are used to describe affective arousal (e.g. I feel pain); a score of 2 means action tendency is how affective arousal is felt and conveyed (e.g. I will punch him) or global expressions of negative or positive arousal (e.g. my friend feels good); a score of 3 shows that affective arousal is expressed by specific emotional word (e.g. we both would be angry); a score of 4 is given when the participant has described a mixture of feelings (e.g. I would feel disappointed, but would be happy that my friend won the prize. My friend is happy) and a score of 5 is given when for “self” and “other” various states of mixed feelings are described (e.g. I would feel sad and angry. My neighbor would feel sympathetic and shameful) (Lane, 2006; Lane & Smith, 2021). The LEAS is more precise and specific

in measuring a change in emotional awareness, unlike the Toronto Alexithymia Scale (TAS-20) which is influenced by negative affect (Subic-Wrana, Thomas, Huber, & Köhle, 2001). The face validity of the translated questionnaire was checked by 4 specialists. The coefficient alpha reliability of the Persian scale, for Self scores, Other scores, and Total scores were .73, .72, and .76, respectively (Yousefi, 2004). The Cronbach's alpha coefficient of self-focused and other-focused emotional awareness was 0.93 and 0.90.

Table 1: Association rule mining example

Antecedents	Consequents	Support	Confidence	Lift
Avoidant attachment	musculoskeletal symptoms	0.35	0.86	1.12

Data Analyses

Data were analyzed using Python 2.7 software and the association rule mining method. Despite correlation and regression analysis, which are bivariate, the association rule mining method can discover relationships among multiple variables at the same time (Dol & Jawandhiya, 2023; Santoso, 2021). Specifically, the association rule mining method is supposed to find "if-then" rules of various variables, in the "antecedent $\rightarrow$ consequence," type (Kaushik et al., 2021). The current study aims to discover rules amongst an unknown subset of the participants to discover subset groups of the data that have characteristics in common.

Association Rule Measures

1. Support: It is used as a measure of significance (importance) of an itemset (Kaushik et al., 2021; Santoso, 2021).
2. Confidence: It is defined as the probability of seeing the rule's consequent under the condition that the transactions also contain the antecedent.
3. Lift: Lift measures how many times more often X and Y occur together than expected if they were

statistically independent.

First, we determined the thresholds for support and confidence based on similar previous studies. We did it by deciding the number of rules we wanted. We used a plot to depict the relation between different support and confidence levels and the number of rules. To this end, we put minimum support on 0.2, which means it satisfies at least 129 out of our 643 samples, and for confidence, we chose 0.3 as the threshold.

For example, according to the row above,

35% of samples have avoidant attachment and musculoskeletal symptoms. With the probability of 86% participants who have avoidant attachment have musculoskeletal symptoms. The lift >1 shows that Avoidant attachment affects musculoskeletal symptoms.

Results

Demographic analysis of participants showed that 185 males and 485 females had completed the questionnaires. They were between 16 to 53 years. Table 2 represents scores of subtypes of somatic symptoms.

Results of association rule mining for relationships between somatic subtypes and psychological risk factors are shown in Table 3. As Table 3 shows, 3 somatic symptoms are associated with ambivalent attachment and low other-focused emotional awareness, 12 symptoms with ambivalent attachment & immature defenses, 13 symptoms with avoidant attachment and neurotic defenses, 8 with avoidant attachment and low self-focused emotional awareness, 2 symptoms with ambivalent attachment

style and neurotic defenses, one with high self-focused emotional awareness and immature defenses, one with immature defenses and one symptom was associated with ambivalent attachment.

This table demonstrates that Gastrointestinal and Cognitive symptoms have similar psychological

risk factors including ambivalent attachment style and immature defense mechanisms. On the other hand, Cardiac, Respiratory, and Musculoskeletal symptoms could be grouped based on their similarity in avoidant attachment style and neurotic defense mechanisms.

Table2: Descriptive statistics of four groups of FSSs and subtypes of somatic symptoms

	Female: Mean(SD)	Male: Mean(SD)
Upset stomach	2.74 (1.63)	1.94 (1.35)
Abdominal pain or stomach pain	1.88 (1.53)	1.68 (0.89)
Bowel cramps	1.92 (0.92)	1.92 (1.12)
Bloated stomach	2.60 (1.10)	1.95 (0.91)
Feeling low on energy	2.96 (1.01)	2.17 (1.20)
Feeling tired	2.25 (0.55)	1.36 (1.08)
Feeling exhausted	2.01 (0.73)	1.59 (0.91)
Feeling physically weak	2.22 (1.60)	1.59 (0.83)
Not feeling fit	2.06 (1.24)	1.44 (1.04)
Feelings of muscle weakness	1.87 (0.66)	1.57 (0.81)
Chest pain	1.50 (1.25)	1.72 (1.01)
Rapid heart beat	1.61 (1.15)	1.86 (1.34)
Pounding heart	2.29 (1.19)	1.79 (1.21)
Tightness around the chest	1.49 (1.36)	1.39 (1.26)
Irregular heartbeat	1.20 (0.85)	0.93 (0.91)
Painful stings in the heart area	1.03 (0.83)	1.24 (0.77)
Feelings of dyspnea	0.92 (0.70)	1.01 (0.93)
Shortness of breath	1.49 (1.06)	1.13 (0.76)
Inability to take a deep breath	1.05 (1.10)	1.14 (0.90)
Sudden fast or deep breathing	0.85 (0.70)	0.65 (1.09)
Breathlessness	1.33 (0.74)	1.33 (0.04)
Muscle pain	1.58 (1.57)	2.18 (0.79)
Pain in bones	1.34 (0.94)	1.41 (0.64)
Pain in joints	2.32 (1.20)	2.32 (0.61)
Back pain	2.53 (1.12)	2.53 (1.12)
Pain in neck	2.82 (1.42)	2.27 (1.20)
Stiffness of fingers, arms, or legs	0.89 (1.00)	1.21 (1.08)
Difficulty concentrating	2.52 (1.04)	2.38 (1.15)
Forgetfulness	2.27 (1.61)	2.01 (1.24)
Having trouble paying attention	2.49 (1.53)	2.10 (1.17)
Unclear or foggy thoughts	2.07 (1.44)	1.82 (0.88)
Distracting thoughts	2.46 (1.75)	2.19 (1.05)
Confusion or feelings of unreality	1.95 (1.21)	2.06 (1.01)
Excessive sweating	0.86 (0.47)	1.48 (1.14)
Hot or cold flashes	0.96 (0.60)	0.88 (1.32)
Dry mouth	1.39 (0.79)	2.04 (1.31)

	Female: Mean(SD)	Male: Mean(SD)
Headache	2.51 (1.12)	1.57 (0.74)
Trembling of hands, arms, or legs	1.94 (0.93)	1.21(1.14)
Tingling feeling in fingers, arms, or legs	1.07 (0.72)	1.38 (0.96)
Numb feeling somewhere in body	1.61 (0.93)	1.89 (0.75)
Nausea	1.34 (0.83)	1.12 (0.71)
Fainting	0.97 (0.57)	0.77 (0.52)
Having trouble swallowing	1.01 (0.91)	0.93 (0.81)
Sore throat	0.96 (0.88)	0.80 (0.61)
Rustling sound in ears	0.95 (0.63)	1.13 (0.71)
Lump in throat	0.89 (0.64)	1.01 (0.70)
Dizziness	1.28 (0.42)	1.09 (0.53)

Table 3: Likely Association Rules with the psychological characteristics as antecedents and single somatic symptoms as consequences

	Support	Confidence	Rules
1.54	0.23	0.62	AmAtt & LOtherEmot → Upset stomach
1.14	0.22	0.58	ImmDef→Abdominal pain or stomach pain
1.56	0.20	0.43	AmAtt & LOtherEmot → Bowel cramps
1.03	0.22	0.52	AmAtt& LOtherEmot →Bloated stomach
1.4	0.20	0.39	AvoidAtt & LSelfEmot →Feeling low on energy
1.4	0.22	0.38	AvoidAtt & LSelfEmot →Feeling tired
1.03	0.23	0.54	AmAtt & NeurDef→Feeling exhausted
1.16	0.21	0.57	AmAtt & ImmDef →Feeling physically weak
1.06	0.30	0.33	AmAtt & LOtherEmot →Not feeling fit
1.27	0.20	0.41	AmAtt →Feelings of muscle weakness
1.02	0.24	0.51	AvoidAtt & NeurDef →Chest pain
1.01	0.24	0.47	LSelfEmot →Rapid heart beat
1.03	0.22	0.45	AvoidAtt & NeurDef →Pounding heart
1.15	0.20	0.57	AvoidAtt & NeurDef →Tightness around the chest
1.34	0.20	0.77	AvoidAtt & LSelfEmot →Irregular heartbeat
1.46	0.21	0.86	AvoidAtt & NeurDef →Painful stings in the heart area
1.14	0.24	0.47	AvoidAtt →Feelings of dyspnea
1.17	0.20	0.47	AvoidAtt & NeurDef →Shortness of breath
1.25	0.23	0.51	AvoidAtt & LSelfEmot →Inability to take a deep breath
1.09	0.26	0.88	AvoidAtt & NeurDef→Sudden fast or deep breathing
1.49	0.32	0.70	AmAtt & LSelfEm →Breathlessness
1.15	0.20	0.56	AvoidAtt & LSelfEmot→Muscle pain
1.04	0.21	0.62	AvoidAtt & LSelfEmot →Pain in bones
1.15	0.20	0.46	AvoidAtt & LSelfEmot →Pain in joints
1.13	0.29	0.53	AvoidAtt & NeurDef→ Back pain
1.29	0.22	0.44	AmAtt & ImmDef → Pain in neck
1.45	0.20	0.36	AvoidAtt & LSelfEmot → Stiffness of fingers, arms, or legs
1.16	0.20	0.66	AmAtt & ImmDef → Difficulty concentrating

	Support	Confidence	Rules
1.42	0.22	0.50	AmAtt & ImmDef & LSelfEm → Forgetfulness
1.37	0.31	0.63	AmAtt & ImmDef → Having trouble paying attention
1.05	0.23	0.43	HSelfEm & ImmDef → Unclear or foggy thoughts
1.49	0.20	0.43	AmAtt & LSelfEm → Distracting thoughts
1.22	0.33	0.67	AmAtt & ImmDef → Confusion or feelings of unreality
1.28	0.29	0.64	AvoidAtt & NeurDef → Excessive sweating
1.18	0.25	0.55	AvoidAtt & NeurDef → Hot or cold flashes
1.48	0.23	0.46	AvoidAtt & NeurDef → Dry mouth
1.36	0.22	0.70	AmAtt & ImmDef → Headache
1.04	0.24	0.47	AmAtt & ImmDef → Trembling of hands, arms, or legs
1.38	0.20	0.81	AmAtt & ImmDef → Tingling feeling in fingers, arms, or legs
1.33	0.22	0.49	AmAtt & ImmDef & LSelfEm → Numb feeling somewhere in body
1.16	0.21	0.48	AmAtt & ImmDef → Nausea
1.24	0.21	0.47	AmAtt & ImmDef → Fainting
1.12	0.23	0.86	ImmDef → Having trouble swallowing
1.38	0.20	0.53	AvoidAtt → Sore throat
1.21	0.20	0.51	AmAtt → Rustling sound in ears
1.04	0.24	0.47	AvoidAtt & NeurDef → Lump in throat
1.19	0.22	0.52	AmAtt & NeurDef → Dizziness

AmAtt: Ambivalent Attachment, AvoidAtt: mechanisms, HSelfEmot: high self-focused
 Avoidant Attachment; NeurDef: Neurotic Defense emotional awareness; LOtherEmot: Low Other-
 Mechanisms; ImmDef: Immature Defense Focused Emotional awareness

Table 4: Likely Association Rules with the psychological characteristics as antecedents and groups of somatic symptoms as consequences

Relations	Lift	Support	Confidence	Rule
4	1.73	0.2	0.83	High Immature defense & low self and other-focused emotional awareness → Gastrointestinal Symptoms
3	1.14	0.23	0.35	High Immature defense & High Ambivalent Attachment → Fatigue symptoms
3	1.28	0.21	0.71	High Neurotic defense & low self-focused emotional awareness → Cardiac symptoms
3	1.24	0.21	0.63	High Neurotic defense & low self-focused emotional awareness → Respiratory symptoms
3	1.08	0.27	0.60	High Neurotic defense & Avoidant Attachment → Musculoskeletal symptoms
3	1.31	0.37	0.63	High Immature defense & low other-focused emotional awareness → Cognitive symptoms
3	1.20	0.21	0.65	Low secure attachment & low self-focused emotional awareness → Other Symptoms

To investigate similarities and differences between symptoms we did association rule mining for the sum of each group of symptoms. The results are shown in table 4. Table 4 shows gastrointestinal symptoms, fatigue symptoms, and cognitive symptoms associated with immature defenses. Cardiac symptoms, respiratory symptoms, and musculoskeletal symptoms are associated with neurotic defenses. Also, fatigue symptoms are associated with an ambivalent attachment style while musculoskeletal symptoms are the results of avoidant attachment. Low other-focused emotional awareness leads to gastrointestinal and cognitive symptoms. Lower levels of self-focused emotional awareness are antecedents of cardiac, respiratory, and other symptoms.

Discussion

The main purpose of this study was to find similarities and differences between somatic symptoms and cluster them based on psychological risk factors. Somatic symptoms are very diverse and not only their underlying mechanisms have been enigmatic to scientists, but also treating and managing them is yet far from being successful. One reason for this is that our knowledge about these symptoms is not complete, especially since we know almost nothing about different somatic types and it is not clear if they are the same and respond to similar treatment or if they are not the same at all and need completely different medical and psychological interventions. Until now, studies have shown these symptoms have similarities and differences. Previous attempts to cluster somatic symptoms either by medical professionals or by statistical methodologies have been inconclusive and controversial. Medical specialists define functional somatic syndromes based on similar symptoms of bodily organs in their specialty. These syndromes have many overlaps and two different medical specialists might diagnose similar symptoms as different functional syndromes (Lacourt et al., 2013; Sattel et al., 2023).

On the other hand, statistical techniques to cluster these symptoms have been inconclusive, and different numbers and types of groups of symptoms

have been proposed (Huang et al., 2022; Lacourt et al., 2013). Thus, there are unanswered questions about the clustering of somatic symptoms based on their manifestations which we thought could be answered if we do clustering based on etiological factors of these symptoms. To do so we used three important psychological factors including levels of emotional awareness, attachment styles, and defense mechanisms.

Our results showed immature defense mechanisms are associated with gastrointestinal, fatigue, and cognitive symptoms. On the other hand, neurotic defense mechanisms are predictors of cardiac, respiratory, and musculoskeletal symptoms. These findings show there is a similarity between somatic symptoms based on defense mechanisms and this is in line with previous studies that classified cardiac and respiratory symptoms as one group and skeletal and muscle symptoms as one group of symptoms (Fink, Rosendal, & Olesen, 2005; Huang et al., 2022). This is in line with previous studies that show different defense mechanisms are associated with different emotion regulation strategies and different types of personality disorders (Nohi & Hasani, 2017; Romeo, Benfante, Geminiani, & Castelli, 2022).

Also, our results revealed different attachment strategies are associated with various types of somatic symptoms. Ambivalent attachment is related to fatigue symptoms but the avoidant attachment is a predictor of musculoskeletal symptoms. As attachment scientists say, attachment strategies consist of qualitatively different internal working models and emotion regulation capacities and strategies (Gillath & Karantzas, 2019). This is by Blatt's dialectic for depression and other psychological symptoms (Luyten, Campbell, & Fonagy, 2019, 2021). As Blatt claims, there are two basic psychological needs of interpersonal relatedness and self-definition which are associated with two prototypes of depression, anaclitic and introjective depression. Researchers have shown a link between these two basic psychological needs, depression prototypes and attachment styles. In brief, avoidant and ambivalent styles are linked to these two deep psychological needs and the association of different types of somatic

symptoms with various attachments means we could classify somatic symptoms into two groups just like Blatt has done with depression (Luyten et al., 2019). Another predicting factor we used was levels of emotional awareness. The literature on somatic symptoms is filled with studies that demonstrate the role of emotion regulation problems specifically alexithymia or having words for our emotions as the major risk factor for all types of somatic symptoms (Afshari & Mir Mohammadi, 2019; McHugh & Egan, 2023).

Our results indicate deficits in self-focused and other-focused emotional processing are associated with different somatic symptoms. A low capacity for other-focused emotional awareness is a predisposition to cognitive symptoms, while lower levels of self-focused emotional awareness are linked to cardiac, respiratory, and other symptoms. This finding is important because it addresses the gap in the literature on the relationship between self and other-focused emotional processing and somatic symptoms. This is similar to what the mentalization theory of psychopathology presents (Luyten, De Meulemeester, & Fonagy, 2021). The mentalizing approach to psychopathology posits that the capacity to understand the internal mental states of oneself and others plays a key role in our mental health and mild or severe impairments in mentalizing have been linked with a wide variety of mental disorders. Several studies show different types of psychiatric disorders are related to different kinds of imbalances between various dimensions of mentalizing such as understanding the mental world of self-other dimension (Allen & Fonagy, 2006; Riem et al., 2018). Our results generally show cognitive, gastrointestinal, and fatigue symptoms are similar, and skeletal, respiratory, and cardiac symptoms are the same based on psychological risk factors. Indeed, it could be said that there are two clusters of somatic symptoms: considering attachment, defense mechanisms, and emotional awareness. This supports the splitters' view about somatic syndromes and shows the opposite of what the lumpers' view of somatic syndromes assumes. Our results revealed somatic syndromes are different and they are not one syndrome because they

do not have similar etiological factors.

Conclusions

These findings show various types of somatic symptoms have qualitatively different risk factors, and this supports the idea that somatic symptoms could be classified in different clusters not only by statistical relationships or medical rules but also by etiological factors. Our findings for treating somatic syndromes imply that psychotherapists should consider the type of syndromes a patient has and its underlying psychological predispositions to manage the problem better.

This study had two major limitations. First, it employed participants from the general population and did not consist of participants with low levels of ego development which could be seen in severe pathologies. So applying the results to the whole population should be done with caution. Second, we assess participants from the capital city of Tehran and as we know cultural effects are important in manifestations of somatic symptoms. Further studies can ensure that all levels of ego development and different cultures are adequately represented.

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