REVIEW ARTICLE (INVITED)

A systematic review of personality temperament models related to somatoform disorder with main focus on meta-analysis of Cloninger's theory components

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ABSTRACT

The systematic review aims to identify four personality temperament models related to somatoform disorder with the main focus on the meta-analysis of temperaments and characters in Cloninger's theory. The literature search was performed on PubMed (Medline), Scopus, Web of Science, Cochrane, and ProQuest for all articles published in English from January 1990 to April 2019. Due to heterogeneity, pooled estimates of the standard mean difference between cases and controls were calculated using the random-effects model. Based on our inclusion criteria, 14 studies were identified, 7 of which were included in the meta-analysis. The results show that there is a significant difference between cases and controls with regard to harm avoidance (HA) ($z = 5.322$, $P < 0.001$), self-directedness ($z = -4.719$, $P < 0.001$), and self-transcendence ($z = 2.848$, $P = 0.004$). Compared to controls, HA and self-transcendence were higher and self-directedness was lower in cases. With regard to other subscales, there was no difference between the two groups ($P > 0.05$). The publication bias was not seen ($P > 0.05$ for Egger statistics). Up to now, very few studies have been focused on the relationship between personality temperament models and somatoform disorder. Among the components of the Cloninger's model, the poor self-directedness along with the abnormally high self-transcendence and HA is the personality component related to the somatoform disorder. Thus, Cloninger's model may potentially draw a personality profile for vulnerability to somatoform disorder. Given the limited number of studies available, future studies may challenge the results of the present study.

Key words: Character, personality, somatic symptom, somatoform disorder, temperament

INTRODUCTION

The Hierarchical Taxonomy of Psychopathology (HiTOP) model has recently been proposed as one of the new dimensional models in the classification of psychopathology.[1]

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This model, derived from extensive studies based on factor analysis methods, includes six levels (from bottom to top: symptoms, components, syndromes/disorders, sub-factors, spectra, and super spectra). Super spectra in the HiTOP indicate higher-order dimensions of psychopathology and a general factor known as the P factor.[1,2] Although, the spectra is the highest level of pathological dimensions identified and named in the HiTOP. The spectra consist of five domains including thought disorder, detachment, disinhibited externalizing, antagonist externalizing, and internalizing (negative affectivity). Meanwhile, HiTOP has not determined an accurate position for somatoform disorders as its suspended sixth domain.[1]

Somatoform disorders, renamed as somatic symptom and related disorders (SSD) in the Diagnostic and Statistical Manual of Mental Disorders (DSM–5),[3] are characterized by thoughts, feelings, or behaviors associated with somatic symptoms or health concerns.[4,5] In DSM-5, the category of SSD is not strictly for medically unexplained symptoms (MUS), but it may occasionally be explained by a medical condition, including a maladaptive response to a somatic symptom.[6] Given the high prevalence rate of somatoform disorder and MUS in different age groups of the general population,[7] trying to solve the problem of the HiTOP model in determining the higher-order factors of the somatoform disorder has been highlighted by its workgroup.[1]

The failure of the HiTOP may be the result of a pure emphasis on factor analysis[1] and related limitations and weaknesses.[8-10] Contrary to the HiTOP, other models such as Research Domain Criteria are largely focused on genetic and neurobiological units of analysis related to the psychopathology.[11-13] Although it is unclear whether these models can cover the limitations of the HiTOP,[14] reviews related to the nonstatistical approaches such as psychobiological models may be important. According to an early theory by Cloninger, as one of the pioneers of this field, a biological pattern of temperament which includes high novelty seeking (NS) and low harm avoidance (HA) may provide the basis for chronic somatic anxiety and clinical presentation of somatization.[15] Torgersen's study[16] on the contribution of hereditary factors to somatoform disorders showed a three-fold concordance in monozygotic than dizygotic pairs, which could potentially confirm the claim of psychobiological theories.

Psychobiological models, such as Cloninger's theory, have been examined in a range of studies related to somatoform disorder.[17-31] Although one of the most important benefits of psychobiological models is the emphasis on nonstatistical methods, the available reports on these models provided scattered and inconsistent findings about the psychobiological components of the somatoform disorder.[17-31] Therefore, collecting and integrating the findings of previous studies can be useful in creating a fresh insight. The current review will show whether personality in psychobiological models has the potential to emerge as one of the components associated with somatoform disorder. And, which aspects of personality are more important? Positive answers to these questions can justify future studies: whether attaching the psychobiological components highlighted in the current study to the HiTOP can help the identification of higher-order dimensions of somatoform disorder. And, which psychobiological components are probably the largest conjunctions? Thus, the systematic literature review and the integration of these scattered findings using a comprehensive meta-analysis is the main objective of the current study. Generally, the systematic review aims to identify four personality temperament models (affective temperaments,[32] positive and negative affect/temperament,[33] temperament and character,[34] affective and emotional composite temperament[35]) related to somatoform disorder. In addition, given the limited number of studies in the field of three psychobiological models,[32,33,35] a meta-analysis was performed on temperaments and characters in Cloninger's theory.

MATERIALS AND METHODS

The procedure of the present systematic review and meta-analysis included sources and databases, search strategies, quality assessment of studies, and data extraction based on the instructions for the PRISMA checklist (registered in PROSPERO-CRD42020141275).

Sources and databases

The review population included all scientific papers published in English from January 1990 to April 2019. The systematic searches were done in various databases including PubMed (Medline), Scopus, Web of Science, Cochrane, and ProQuest. An additional search was done on Google Scholar.

Search strategies and criteria for selecting study

In the first step, the keywords required for the search process were determined by two members of the research team (AZ and SK). The keywords were chosen based on previous systematic reviews and the literature related to the field of the study. The searches in title/abstract were carried out using the keywords list that included *("Temperament"* OR *"TCI"* OR *"TCI-R"* OR *"TPQ"* OR *"novelty seeking"* OR *"harm avoidance"* OR *"reward dependence"* OR *"persistence"* OR *"self-directedness"* OR *"cooperativeness"* OR *"self-transcendence"* OR *"affective temperament"* OR *"TEMPS-A"* OR *"PANAS"* OR *"positive affect"* OR *"negative affect"* OR *"affective emotional composite temperament"* OR *"AFECTS"*) (AND) (*"somatization disorders"* OR *"somatoform disorder"* OR *"somatic symptom disorder"* OR *"illness anxiety disorder"* OR *"conversion disorder"* OR *"factitious disorder"*). Only English-language original

papers published in academic journals; studies related to adults 18 years and older; and those studies that used the Temperament and Character Inventory (TCI), TCI-Revised (TCI-R), the Tridimensional Personality Questionnaire (TPQ), the Positive and Negative Affect Schedule (PANAS), the Temperament Evaluation of the Memphis, Pisa, Paris, and San Diego (TEMPS), or the Affective Emotional Composite Temperament Scale (AFECTS) to measure personality dimensions were entered into the systematic review. Mutually, publications outside of the above-mentioned time period; reviews and meta-analyses; interventional studies and other studies with irrelevant design, qualitative reports, dissertations, and unpublished papers; abstracts or unavailable full texts; studies that used unstructured interviews and nonstandard instruments for assessing somatic disorders; and low-quality reports based on STrengthening the Reporting of OBservational studies in Epidemiology (STROBE) were excluded. In addition, studies that did not report sample size for cases or controls and mean (standard deviation) personality scores were excluded from the meta-analysis. Each of the personality models presented in five studies or less was not entered into the analysis [Figure 1].

Assessment of the quality of studies

The quality of the identified studies was assessed using the 22-item checklist of STROBE. The checklist is used to evaluate the quality of cross-sectional, case–control, survey studies, causal-comparative, and clinical trial publications. The qualitative evaluation process of the papers was separately conducted by two members of the research team (KR and SK), and in case of disagreement between them, the dissonance was resolved through discussion with the third person (FR).

Data extraction

A table was designed to record the extracted data in the form of a regular categorization for simple understanding. After applying inclusion and exclusion criteria, the data from each study were entered into the registration form. The process of data synthesis included tabulation; detailed descriptions of the findings of each study; and the organization of studies based on authors, year, and region, main focus of the paper, samples, sample size, age mean ± standard deviation (or range) of the participants, design, statistics, measurement tools and relevant variables, findings (correlation coefficients or standard mean difference), limitations, and level of evidence.

Statistical analysis

The selected seven papers were entered into the meta-analysis according to the results reported in each text. Seven meta-analyses were performed separately to calculate the standard mean difference of the TCI subscales between cases with the somatoform disorder and healthy controls. The TCI subscales included NS, HA, reward dependence (RD), persistence (P), self-directedness (SD), cooperativeness (C), and self-transcendence (ST). Studies were combined based on sample size, mean, and standard deviation of the variables in the cases and healthy controls. Pooled effects sizes for group differences (cases vs. healthy controls) were presented with 95% confidence intervals using a combined forest plot. Hedges' g values were used for measuring the effect size. Differences between cases and healthy controls were compared using the z statistic.

Due to heterogeneity (I^2 higher than 50% in 57% of the studies), pooled estimates of the standard mean difference were calculated for the TCI subscales and somatoform disorders using the random-effects method. We studied the heterogeneity of the study samples using the I^2 statistics for a 95% confidence interval. $P < 0.05$ for I^2 higher than 50% was considered a significant heterogeneity. Egger's test was used to detect possible publication bias. Because of the lack of coverage of some of the TCI subscales in all studies, the number of studies entered into the meta-analysis related to each of the TCI subscales is not equal [Figure 2]. All hypotheses were tested at the level of <0.05 and performed using the second version of the Comprehensive Meta-Analysis (CMA.2) software (Developed by Borenstein, Hedges, Higgins, & Rothstein, USA).

RESULTS

Studies included in the review

A primary search yielded 77 articles (PubMed = 17, Scopus = 6, Web of Science = 6, Cochrane = 44, and ProQuest = 4). Fourteen articles were also found through a manual search for author and reference. Eventually,

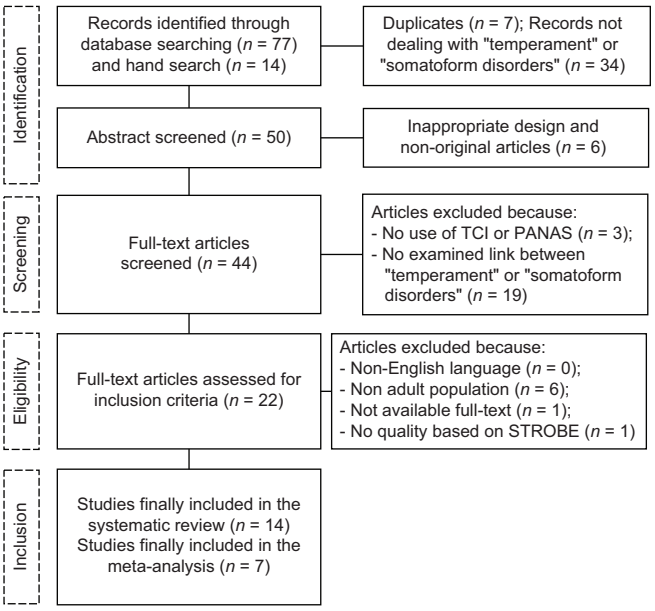

Figure 1: A flow diagram of the study selection process based on PRISMA

14 articles were entered into the review. The process of selecting studies is shown in Figure 1. Seven studies had samples with somatoform disorders which were compared with the healthy controls. Four studies were conducted in Turkey and the USA and other studies were conducted in Germany (two studies), Italy, Finland, Brazil, and Taiwan (one study each). Seven studies used TCI or TPQ and three studies used PANAS. One study used the TEMPS tool and another study used the AFECTS. The summary of the methods and results of the studies is presented in Table 1.

Differences between cases and controls with regard to temperament and character inventory subscales

Figure 2 presents the standard mean difference between cases and controls in TCI dimensions. The effect sizes in a pooled forest plot with 95% confidence interval, the *z*-test value, and its statistical significance are presented for each subscale. As can be seen, there is a statistically significant difference between cases and controls in HA ($z = 5.322$, $P < 0.001$), SD ($z = -4.719$, $P < 0.001$), and ST ($z = 2.848$, $P = 0.004$). In other subscales, there was no difference between the two groups ($P > 0.05$). The publication bias was not seen in the difference between any of the variables ($P > 0.05$ for Egger statistic). Egger statistic for NS, HA, RD, P, SD, cooperativeness, and ST was 0.351 ($P = 0.737$), 1.665 ($P = 0.147$), 0.366 ($P = 0.727$), 0.378 ($P = 0.721$), 1.250 ($P = 0.337$), 1.607 ($P = 0.249$), and 0.817 ($P = 0.499$), respectively.

DISCUSSION

The early systematic review showed that a very limited number of studies have examined the relationship between the positive/negative affect (measured by PANAS), the affective temperaments (measured by TEMPS), and the affective and emotional composite temperaments (measured by AFECTS) models and somatoform disorder. Three studies have reported an association between PANAS and somatoform disorder.[27,28,31] The relationship between each of the TEMPS[18] and AFECTS[25] with the somatoform disorder was studied only in one study. The present meta-analysis on the TCI/TPQ dimensions shows that there is a significant difference between cases with

Table 1: Basic characteristics of the studies included in the systematic review and meta-analysis*

Author (year)	Region	Main focus of article	Samples	*n*		Age (mean)	Design
				Cases (male:female)	Controls (male:female)		
Amann *et al*. (2009)[18]	Germany	Affective temperaments	Inpatients with somatoform disorder	19:25	27:17	41.6±16.6	CC
Battaglia *et al*. (1998)[19]*	Italy	Temperament and co-occurrence of panic and somatization disorder	Patients with panic and somatization disorder	0:59 (18 with panic and somatization; 41 with panic only)	0:22	33.0±9.0	CC
Bayon *et al*. (1996)[20]	USA	Relation of TCI and MCMI-II	Psychiatric outpatient	22:87	no	44.4±13.7	CS
Erten *et al*. (2013)[21]*	Turkey	Temperament/character and conversion disorder	outpatients with conversion disorder	52:6	53:4	31.1	CC
Güleç *et al*. (2014)[22]*	Turkey	Suicide	Patients with conversion disorder	14:80 (5:28 with suicide attempt; 9:52 without suicide attempt)	15:35	30.0±10.7 30.8±10.8	CC
Hakala *et al*. (2006)[23]*	Turkey	Temperament	Patients with somatization disorder	0:10	0:12	46.6±8.9	CC
Huang *et al*. (2016)[24]*	Taiwan	Temperament	Patients with somatoform disorders	49:99	50:96	52.2±10.4	CC
Hyphantis *et al*. (2013)[25]	Brazil	Affective temperaments	Adults	4472:5465	no	32.7±10.9	CS
Karvonen *et al*. (2006)[26]*	Finland	Temperament and somatization disorder	Young adults	6:61	447:470	31.0±0.0	CC
Kvaal and Patodia (2000)[27]	USA	Positive/negative affect and somatic symptoms	Nonpsychiatric inpatients	47:81	no	NR	CS
Preis *et al*. (2017)[28]	Germany	Cognitive/affective theory and somatic symptoms	General population	29	21	49.8±10.7	Quasi-experimental
Russo *et al*. (1994)[29]	USA	Somatization and personality	Medical patients	22	no	52.1±14.8	CS
Sarisoy *et al*. (2015)[30]*	Turkey	Temperament/character	Patients with conversion disorder	6:54	7:53	30.6±10.7	CC
Stonnington *et al*. (2013)[31]	USA	Somatization and affect	Medical outpatients	9:50 (29 with conversion disorder; 30 with functional somatic syndromes)	10:20	42.4±12.4 43.4±11.2	CC

Contd...

Table 1: Contd...

Author (year)	Statistical methods	Instruments		Findings	Level of evidence, limitations
		Somatoform disorder	Temperament	Current symptoms associated with/differenced in	
Amann *et al*. (2009)[18]	*t*-test; χ^2; Fisher's test; Mann-Whitney U test	SOMS (DSM-IV), ICD-10 interview	TEMPS-M	High cyclothymic; high hyperthymic; high irritable; high anxious	Low, small sample size
Battaglia *et al*. (1998)[19]*	Spearman's correlation; MANOVA; *post hoc* Scheffe test	DIS-III-R (DSM-III-R and DSM-IV)	TPQ (NS, HA, RD, P)	High NS; High HA; Low RD	Low, small sample size; limited to the women
Bayon *et al*. (1996)[20]	Pearson's *r*; MRA; Bonferroni correction	MCMI-II (DSM-III-R)	TCI-240	+ST	Low, small sample size; consecutive sampling
Erten *et al*. (2013)[21]*	*t*-test; χ^2; Fisher's test; Mann-Whitney U-test; Kruskal-Wallis test	SCID-I (DSM-III-R and DSM-IV)	TCI-240	High HA; low P; low SD; high ST	Moderate, small sample size
Güleç *et al*. (2014)[22]*	ANOVA; Tukey's *post hoc*; logistic regression	SCID-I (DSM-IV)	TCI-240	High HA; low SD; low C; high ST	Moderate, consecutive sampling
Hakala *et al*. (2006)[23]*	Logistic regression	DSM-IV criteria; SCL-90	TCI-240 (NS, HA, RD, P)	Low NS; high HA	Low, small sample size; limited to the women
Huang *et al*. (2016)[24]*	*t*-test; χ^2; Bonferroni correction; linear and logistic regression	PHQ-15; HAQ; SCID-I (DSM-IV)	TPQ (NS, HA, RD)	Low NS; high HA; low RD	Moderate
Hyphantis *et al*. (2013)[25]	ANCOVA; hierarchical multiple and logistic regression	SCL-90-R	AFECTS (only affective temperaments)	+ Dysphoric; + depressive	Moderate
Karvonen *et al*. (2006)[26]*	*t*-test; χ^2; Fisher's test; ANOVA; logistic regression	HSCL-25; DSM-III-R criteria	TCI-240 (NS, HA, RD, P)	High HA; high RD	Moderate
Kvaal and Patodia (2000)[27]	Pearson's correlation	PILL-54	PANAS	+ NA	Low, consecutive sampling
Preis *et al*. (2017)[28]	χ^2; ANCOVA; Pearson's correlation	Two parallel forms of somatic symptoms	PANAS	Low PA; high NA	Low, small sample size; nonrandomized sampling
Russo *et al*. (1994)[29]	Pearson's correlation; multiple regression	DIS-III-R (DSM-III-R)	TPQ (NS, HA, RD)	+ HA	Low, small sample size
Sarisoy *et al*. (2015)[30]*	*t*-test; χ^2; ANOVA	DES; DSM-IV-TR criteria	TCI-240	Low NS; high HA; low SD	Low, consecutive sampling
Stonnington *et al*. (2013)[31]	ANOVA; Tukey's *post hoc*; Pearson's correlation; linear and logistic regression	SCL-90; DSM-IV criteria	PANAS	Low PA	Low, small sample size; consecutive sampling

CS – Cross-sectional; CC – Case–control; SOMS – Screening for Somatoform Symptoms; TEMPS-A – Temperament Evaluation of the Memphis, Pisa, Paris, and San Diego Autoquestionnaire; DIS-III-R – Diagnosis Interview Schedule-III-R; TPQ – Tridimensional Personality Inventory; SCID-I – Structured Clinical Interview for DSM-IV Axis I Disorders; TCI – Temperament and Character Inventory; PHQ – Patient Health Questionnaire; HAQ – Health Anxiety Questionnaire; SCL-90-R – Symptom Checklist-90-Revised; AFECTS – Affective and Emotional Temperament Composite Scale; HSCL-25 – Hopkins Symptom Checklist-25; PANAS – Positive and Negative Affect Schedule; PA – Positive affect; NA – Negative affect; PILL – Pennebaker Inventory of Limbic Languidness; DES – Dissociative Experience Scale; NR – Not reported; HA – Harm avoidance; NS – Novelty seeking; MRA – Magnetic resonance angiography; MCMI-II – Millon Clinical Multiaxial Inventory-II

the somatoform disorder and healthy controls in HA, SD, and ST.

Character dimensions and somatic symptom and related disorder

Cloninger and Svrakic[36] characterize character as conscious self-aware plans that consist of three cognitive sets of the individual (SD), social (cooperativeness), and universal (ST). Contrary to temperaments that are considered to be the habit systems and unconscious automatic reactions, characters are the mental and cognitive dimensions of an individual, providing a conceptual insight for her/him.[36] The results of the current study showed that in patients with somatoform disorder, SD (but not cooperativeness) is very poor. Based on the findings from a systematic review, Fassino *et al*.[37] introduced poor SD as the core of mental disorders. In line with our findings, a study[38] using factor analysis showed that poor SD in the TCI and self (identity/self-direction) deficits in personality functioning (related to the criterion A in the AMPD) were loaded on a common higher-order factor called internalizing domain; while the cooperativeness subscale in the TCI and interpersonal (intimacy/empathy) deficits were loaded on a common higher-order factor called externalizing domain. Therefore, the somatoform disorder may be an impaired function (criterion A) associated with the internalizing domain (criterion B) in the HiTOP model. In the HiTOP, identity problems, separation insecurity, anxiousness, and hostility are traits associated with the internalizing domain.[1,2] Clark and Ro's study[38] also showed that all of these personality traits along with SD were loaded on the internalizing factor. Other studies and reviews have also confirmed the relationship between SD and maladaptive traits, identity styles, and disorders related to the sub-factors of the internalizing domain, including mood and anxiety disorders.[37,39-41] Given the vacancy of criterion A in the HiTOP and its potential for

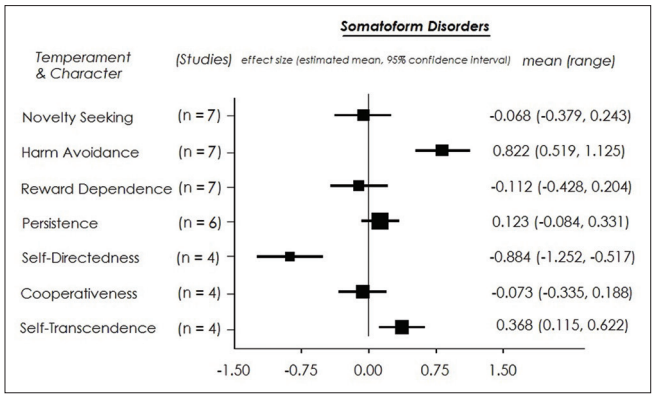

Figure 2: The pooled forest plot for temperament and character inventory subscales contains a heterogeneous number of studies for each of the temperaments and characters. Difference between cases and healthy controls in the temperament and character inventory subscales: novelty seeking ($z = -0.430$, $P = 0.667$), harm avoidance ($z = 5.322$, $P < 0.001$), reward dependence ($z = -0.694$, $P = 0.488$), persistence ($z = 1.166$, $P = 0.244$), self-directedness ($z = -4.719$, $P < 0.001$), cooperativeness ($z = -0.549$, $P = 0.583$), self-transcendence ($z = 2.848$, $P = 0.004$)

taking personality functioning,[42] SD may be considered a personality functioning related to the internalizing domain in this model.

Another finding suggests that ST in patients with somatoform disorder is higher than healthy controls. This finding is consistent with previous studies.[20-22] From the perspective of Cloninger, the development of a somatization or conversion disorder is the result of a complex adaptive process that involves nonlinear interactions among multiple contributing factors.[43] ST, as one of these possible factors, has a positive relationship with most personality disorders, especially paranoid and schizotypal personality disorder.[44,45] In addition, a relationship has been reported between the symptoms of these personality disorders and somatoform disorder,[46,47] which can indicate the presence of a delusion in these two disorders. The content of these delusions in paranoid and schizotypal patients is related to the bizarre and unconventional beliefs, and in patients with the somatoform disorder is related to the concern and anxiety associated with a physical illness. Somatic symptoms associated with fixed beliefs may express somatic delusions.[48] Although ST in healthy people represents spirituality, in patients with the somatoform disorder, it may indicate the severity of the delusions associated with the presence of a serious illness.

Temperament and somatic symptom and related disorder

Abnormal temperaments are seen in 70% of patients with somatoform disorder, which is significantly higher in comparison to the general population.[18] The results of the current meta-analysis showed that HA is higher among patients with somatoform disorder than healthy controls, while in other aspects of the temperament, there is no difference between the two groups. This finding is consistent with the results of Güleç *et al*.[22] and Karvonen *et al*.[26] Russo *et al*.[29] found that HA is the only temperament associated with an increase in the severity of the somatoform disorder. HA, as a component of state and trait dependence, may be a type of cognitive vulnerability to the development of mental disorders such as somatoform disorder.[29] In confirmation of this probability, a study[49] showed that there was a positive relationship between somatic complaints and cognitive/health problems. Furthermore, the findings of a study[38] showed that high HA in the TCI and internalizing domain traits (criterion B in the AMPD) in the HiTOP, including emotional problems, separation insecurity, anxiousness, and avoidance, are loaded on a common higher-order factor called negative affectivity. Other studies and reviews have also confirmed the relationship between HA and maladaptive traits and syndromes related to the sub-factors of internalizing domain, including mood problems, anxiety disorders, and eating pathology.[37,40,41,50] In addition, previous reports[51,52] highlighted the relationship between HA and negative affectivity (neuroticism).

On the other hand, high HA in patients with somatoform disorder represents multiple anxieties.[24] In patients with somatoform disorder, neuroses containing the fatigability trait, which is a component of HA, is higher compared to the other traits.[24] Fatigability and fear/worry are the main components of HA that express the presence of chronic dysphoria. Studying a large population, Hyphantis *et al*.[25] found that there was a positive relationship between the dysphoric temperament and somatization symptoms. Fear/worry and chronic dysphoria are the key features of neuroticism and negative affectivity,[29] which is also mentioned in the HiTOP model.[1] Several studies have pointed to the relationship between neuroticism/negative affectivity and somatoform disorder.[53-55] Recent reports have also suggested that the HA has a similar function to the neuroticism in the FFM and can be useful in the diagnosis of psychiatric disorders.[50,51,56]

Strengths and limitations

The current meta-analysis is a pioneering study that comprehensively examines the psychobiological aspects of personality in patients with somatoform disorder. Because of the emphasis on the dimensional approach to psychiatric assessment in recent reports,[1,11-13] a comparison of the TCI components between cases with SSD and healthy controls was done based on a dimensional measurement. The importance of this study comes from the recent reconsideration in DSM-5 and ICD-11, which have approached the dimensional models for etiology, diagnosis, and taxonomy.

Although this meta-analysis offers an important step in reviewing psychobiological components of personality associated with somatoform disorder, some limitations

should be noted. First, subgroups including age and sex groups were not analyzed separately. Due to the higher incidence of somatoform disorder in women and younger people,[7,57] subgroup analysis could provide more accurate results. Second, due to the lack of access to the PsycINFO and PsycNET databases as the main sources of psychiatric and psychology reports and publications, this study may miss some of the related papers. All the studies included in the meta-analysis were low or moderate in terms of the level of evidence. Although this issue increases the potential risk of bias in individual studies, the present meta-analysis was based on these few studies. In this study, only temperament-based personality models were examined. For this reason, studies of the FFM that may help to identify higher-order dimensions of somatoform disorder in the HiTOP were not reviewed. In future studies, considering these limitations may provide more valid and reliable findings.

CONCLUSIONS

The current systematic review shows that few studies have investigated the relationship between the psychobiological models toward personality and somatoform disorders. The majority of studies focused on the TCI components in patients with somatoform disorder. Based on the present meta-analysis, the poor SD along with the abnormally high ST and HA is the personality component related to the somatoform disorder. Thus, the TCI/TPQ may potentially draw the personality profile of somatoform disorder to differentiate from other mental disorders. However, the number of studies is very limit. Therefore, there is no definitive conclusion which implies the TCI/TPQ is a practical instrument for diagnosing the somatoform disorder or the vulnerability to the disorder in the general population. Now, due to the weakness of the HiTOP in determining the main domain related to the somatoform disorder on the spectra level, the question becomes more serious as to whether adding the TCI/TPQ components to the HiTOP model can be effective in determining the higher-order factors of somatoform disorder. On the other hand, another question is whether the TCI/TPQ is generally able to facilitate the entry of criterion A in the AMPD into the HiTOP. Future studies may seek to answer these important questions.

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Conflicts of interest

There are no conflicts of interest.

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