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Development and Validation of the Sensitivity to Infection Threats Scale (SITS)

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ABSTRACT

The present research emphasizes the role of learning in response changes to infection threats and suggests a new instrument. This preliminary study aims to develop a brief tool (SITS: Sensitivity to Infection Threats Scale) that measures individuals' health sensitivity to infection threats. The present research utilized the Brief Symptom Inventory—phobic anxiety and hostility subscales and the newly developed SITS. The reliability and validity of SITS were examined through construct, divergent, and convergent validity as well as internal consistency and test-retest reliability. The underlying dimensions were explored through an exploratory factor analysis (EFA N = 142; Mage = 20.29, SDage = 2.34), and the EFA dimensions were confirmed through a confirmatory factor analysis (CFA N = 236; Mage = 20.36, SDage = 2.24). The EFA and CFA results supported a correlated four-factor model and the 20-item structure of the SITS. These four factors included Preoccupied, Avoidant, Physiological, and Cautionary Sensitivities. The overall scale and subscales had good internal consistency, test-retest reliability, and convergent and divergent validity. The SITS is a reliable scale and has the potential to deepen our understanding of human behaviour in responding to infection threats.

Keywords:
Infectious diseases, dual process theory, health sensitivity, health behaviours

1. Introduction

Infections have been a threat to human health throughout history, and the recent years have been no exception. Several dreadful pandemics have occurred in the last four decades (e.g., HIV/AIDS, SARS, H1N1, Ebola, and Zika). The current outbreak of SARS-CoV-2 (COVID-19) has become a global crisis. As of September 2022, more than 600 million people worldwide were infected with COVID-19, and 6 million people died due to the disease (World Health Organization, 2022). This glooming recent history of pandemics fuelled research about the psychological correlates of human behaviour in response to infection threats. Researchers thus focused on explaining how people respond to or ignore the risk of infections (Schaller & Duncan, 2007). Weston and colleagues (Weston et al., 2018), however, reviewed 42 studies published between 2002 and 2015 and concluded that only five out of the 42 studies referred to a psychological theory in explaining human behaviours to preserve their health. One of the reasons for this insufficient attention to theory may be the lack of theory-driven assessment tools in the field. Therefore, in this paper, we intended to examine the existing assessment tools roughly by organizing them into three lines of research and suggested a scale to measure a relatively understudied construct—health sensitization or health sensitivity based on Dual Process Theory (e.g., Groves & Thompson, 1970). We further aimed to explain the construct of health sensitivity and relevant studies below by reviewing the present approaches and assessment tools measuring behavioral responses to infection threats.

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The first line of research indicates the essential role of health promoting behaviors. This area of research is primarily concerned about how people preserve their health and manage their health status (e.g., interpersonal functioning, health preserving and nutrition behaviors, and health care) (Ping et al., 2018). Secondly, this line of research has also examined how people caution against infection risks (de Bruin & Bennett, 2020; Funk et al., 2010). For example, de Bruin & Bennett (2020) examined the relationship between risk perception and the practice of health protective behaviors (e.g., hand washing and avoidance of crowded areas) They noted that when people perceive a high level of risk, they tend to engage in behaviors to avoid the infection risk.

The second line of research concentrates on maladaptive responses to exposure to infection threats. Anxiety and fear are the key psychological constructs in this direction of research. Studies conducted on the most recent pandemics such as the Ebola outbreak in 2013-2016 and the SARS outbreak in 2002-2003 showed that individuals might develop ongoing anxiety/fear responses (Desclaux et al., 2017). While some individuals are physiologically unharmed, they may develop psychological problems such as Sarsphobia (Cheng, 2004) or Coronaphobia (Asmundson & Taylor, 2020). This line of research has also pointed to the psychological environment (e.g., social restrictions). For example, in vulnerable populations, the psychological environment and exposure to infection threats may intensify mental health concerns such as anger, anxiety, trauma, insomnia, obsessive behaviors, depression, and helplessness (e.g., Cava et al., 2005; Cheng & Tang, 2004; DiGiovanni et al., 2004; Hawryluck et al., 2004; Salkovskis et al., 2002; Shultz et al., 2015; Sim et al., 2010) Moreover, these mental health concerns might be relatively long lasting and may continue for years (Cava et al., 2005; Gan et al., 2004).

The third line of research has emphasized the evolutionary adaptive mechanisms such as in-built attitudes toward the pathogens (Faulkner et al., 2004; Navarrete & Fessler, 2006; Park et al., 2007). This research axis directly examines human responses to infection threats. Some researchers used the concept of behavioral immune system (BIS) (Duncan et al., 2009; Jones & Salathé, 2009; Maruish, 2011; Torales et al., 2020; Verelst et al., 2016). Schaller and Park (2011) suggest that the BIS helps to recognize pathogens in the environment, activates a set of protective emotional and cognitive reactions, and encourages people to engage in behaviors to avoid possible pathogens. In this sense, they avoid contact with other people who are suspected of infection. This system works on a realistic alarm mechanism triggered by bodily and environmental cues: These cues activate disgust, negative thoughts, and accompanying aversive behavioral responses (Faulkner et al., 2004; Schaller & Duncan, 2007), and they keep the organism away from the potential pathogen carriers (Park et al., 2007). Table 1 provides the samples of the conceptually relevant instruments reviewed during the development process of the Sensitivity to Infection Threats Scale (SITS).

Table 1. *The Instruments Reviewed in the Development Process of the SITS*

The Instrument Name	Purpose	Sample Item
Instruments Measuring Health Protective Behaviors		
Health Survey Short Form SF-36v2 (Maruish, 2011)	Measures physical and mental health-related constructs	Sample item is not provided due to copyrights.
Lifestyle Practices and Health Consciousness Inventory (Kalkbrenner & Gormley, 2020)	Measures lifestyle practices and health awareness supporting psychological and physical wellbeing	e.g., "Had headache severe enough to interfere with your daily routine."
Subjective Health Complaints Questionnaire (Eriksen et al., 1999)	Measures subjective health complaints	e.g., "headache," "low back pain"
Sickness Impact Profile (SIP) Questionnaire (Prcic et al., 2013)	Measures general health status, dysfunction of patients' everyday behavior in more detail, and is generally related to disease	e.g., "I am working at my usual job but with some changes."
Instruments Measuring Maladaptive Responses		
Hospital Anxiety and Depression Scale (HADS; Zigmond & Snaith, 1983)	Measures depression and anxiety related to health status	e.g., "I feel restless as I have to be on the move."
Dimensional Obsessive-Compulsive Scale (DOCS; Abramowitz et al., 2010)	Measures obsessive-compulsive symptoms	e.g., "To what extent have you avoided situations in order to prevent concerns with contamination or having to spend time washing, cleaning, or showering?"
The Health Anxiety Inventory (Salkovskis et al., 2002)	Measures the level of health anxiety, both clinical and non-clinical	e.g., "I constantly have images of myself being ill."
Anxiety Sensitivity Index (ASI; Reiss et al., 1986)	Measures one's beliefs about anxious body sensations, cognitive symptoms, and social consequences of displaying the symptoms	e.g., "It scares me when my heart beats rapidly."

Instruments Measuring Evolutionary Mechanisms		
Perceived Vulnerability to Disease Questionnaire (PVD; Duncan et al., 2009)	Measures personal vulnerability to the transmission of infectious diseases	e.g., "If an illness is 'going around,' I will get it."
Distugst Sensitivity Scale (Haidt et al., 1994)	Measures reactions to disgust elicitors, e.g., food, animals, and body products	e.g., "It bothers me to see someone in a restaurant eating messy food with his fingers."

Note: The table is not conclusive of the instruments used in the field to measure the construct of anxiety. The instruments mentioned are the ones used in the current study when developing the SITS.

1.1. Health Sensitivity

Health sensitivity is not a widely established construct in the field, at least for studying human responses to infection threats. Schöllgen et al. (2016) initially discussed health sensitivity as a psychological construct that explains individuals becoming sensitive to the (negative) changes in their health. They introduced the idea of health sensitivity as "how susceptible an individuals' well-being is to changes in physical health" (p. 1). This definition implies that the negative changes in health status increases one's health sensitivity.

We further explicate health sensitivity by using dual process theory (DPT), suggesting that individuals may become health sensitive in response to infection threats. DPT explains the learned response sets through the repeated exposure to stimuli (Groves & Thompson, 1970). The theory proposes two major learned response sets: 'Habituation' refers to a decreased while 'sensitization' refers to an increased responsiveness to the repeated stimuli exposure. DPT links its mechanism to the inhibitory and excitatory systems in the central nervous system. Sensitization occurs as the repeated aversive news highlight the risk of infection. That is, individuals learn what and how to avoid risk elements as they are exposed to these repeated aversive news or stimuli. Conditions like strong, noxious, and unpredictable stimulation (Overmier, 2002), and sustained arousal to stimulation and perceptual factors like attention (Eriksen & Ursin, 2002) may lead to sensitization. Eriksen and Ursin (2004) suggest that sensitization produces lower thresholds for self-reports of stress, indicating that people become more sensitive about their health status and eager to seek professional assistance. Therefore, we believe that dual processes underline individuals' responses to anticipated infection threats, which is conceptualized as health sensitivity in the present study.

Previous research provides evidence for health sensitivity to infection threats. Individuals exposed to pandemics actually display behavioural responses that provide evidence for increased arousal in response to previously neutral stimuli (Shultz et al., 2008; Taylor, 2019). During the pandemic, individuals are exposed to information about the consequences of COVID-19 infection from many sources, such as the social media, news, daily conversations, and public health authorities. Moreover, Potter and colleagues (2021) state that sensitization may be more prevalent when health conditions are new and acute and "representing experiences that bring fear and uncertainty, as well as a more pervasive impact on everyday life" (p. 2). This is the case in an infection threat, especially caused by a newly identified virus. Based on DPT, we suggest that individuals with repeated exposure to the consequences of COVID-19 infection are likely to go through behavioral changes and become more sensitive to infection threats.

1.2. The Need for a New Instrument

During our clinical practice and interactions with university students, we noticed that they had remarkable concerns regarding the risk of COVID-19 infection. However, as summarized in previous sections, the existing instruments do not capture these concerns and the increased sensitivity toward infectious diseases. We first examined the current literature in order to identify the alternative tools to measure this increased sensitivity. The aforementioned three lines of research offer substantial insight about individual differences in behavioral change dynamics in preserving health and cautioning against the infection related health risks. However, these lines of research do also have their shortcomings in capturing health sensitivity. The literature on health preserving behaviors often addresses the presence or absence of behaviors such as smoking or lack of exercise, which would eventually harm health (Ping et al., 2018). These studies provide substantial information, yet they does not explain individuals' response against infection risks. The second line of research addresses the psychological impacts of exposure to infection threats or being infected (Desclaux et al., 2017). However, not all responses to infection threats entail psychological problems such as obsessive-compulsive or anxiety disorders. The third line of research addresses psychological mechanisms, which explain how subtle cues of potential pathogens activate the organismic alarm mechanism (Schaller & Park, 2011). Nevertheless, these subtle somatic or environmental cues may activate the organismic alarm mechanism falsely at times (Haselton & Nettle, 2006; Kurzban & Leary, 2001), thereby linking minimal cues with an unfounded infection risk (Park et al., 2007). In addition, this system theoretically does not work when there are no realistic activating cues in the environment (Schaller & Park, 2011) as it is the case in many COVID-19 infections. In addition, it does not explain individuals' psychological state developed by learning in the absence of the cues affiliated with pathogens. The measurement tools used in these three lines of studies measure the variables of health-related or health-promoting behaviors, psychological consequences of health-related issues, or evolutionary-oriented health protective mechanisms. However, these measures do not assess the learned and acquired sensitivity. Resultantly, the present study aims to develop a new instrument which measures the learned and acquired sensitivity.

Drawing upon DPT, we hypothesized that health sensitivity is a learning process in nature and would have cognitive, emotional, and physiological behavioral components. For example, individuals' health sensitivity correlates with their increased attention to the changes in their physical health (Schöllgen et al., 2016), their cautionary actions to preserve their health (Potter et al., 2021), and their physiological reactions such as an increase in their physiological symptoms (Eriksen et al., 1999). Therefore, we hypothesized that individuals with an increased health sensitivity would concentrate on their risk of being infected, show emotional reactions, and report activated physiological reactions when they mind infectious health risks. Different from non-infectious diseases, infectious pathogens pose threats to everyone in the community, and individuals develop sensitivity to the anticipated risks. Therefore, we hypothesize that health sensitivity includes individuals' cognitive awareness about the risks to their health, their acute attention to the feelings, and their overall physiological arousal in response to infection threats.

2. Method

2.1. Participants

Exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) had different samples, including 378 university students in total. The EFA sample consisted of 142 participants (three outlier cases were omitted, bringing the final sample to 139). The CFA sample included 236 participants. The participants were recruited using convenience sampling, and they were undergraduate students at a Turkish state university, enrolled in teacher-training courses during the spring semester of 2020. Table 2 presents the descriptive characteristics of these two samples.

In the EFA sample, 108 participants were females (78%), and 31 participants were males (22%). Regarding the participants' departments, 73 (53%) participants were in a teaching department, and 66 (47%) participants were enrolled in a social sciences department. Eighty one (58%) of them were freshmen, 33 (24%) were sophomores, and 25 (20%) were junior students. In terms of socio-economic status (SES), 19 (14%) participants were on low incomes, 116 (83%) were on middle incomes, and four were on high incomes (3%).

Table 2. *Descriptive Statistics and Bivariate Correlations among Variables*

	M	*SD*	*Skew*	*Krtsis*	*Age*	*F1*	*F2*	*F3*	*F4*	*SITS_T*	*Anx*	*Host*
EFA Sample (Females = 108; Males = 31)												
Age	20.29	2.34	3.62	18.08								
					--	-.07	-.08	-.09	-.05	-.09		
F1	2.01	1.07	0.31	-0.62		--	.77***	.70***	.63***	.91***		
F2	1.98	1.12	-0.64	-0.10			--	.73***	.62***	.92***		
F3	1.19	0.94	1.04	0.78				--	.65***	.87***		
F4	2.59	1.11	-0.01	-0.53					--	.77***		
SITS_T	1.86	0.94	0.64	0.07						--		
CFA Sample (Females = 181; Males = 54; Nonbinary = 1)												
Age	20.36	2.24	2.53	9.13	--	.04	.01	.09	.03	.02	.07	.08
F1	1.69	0.99	0.38	-0.64		--	.70***	.69***	.60***	.90***	.45***	.20**
F2	1.89	1.07	-0.07	-1.07			--	.66***	.64***	.90***	.56***	.12
F3	0.92	0.89	0.81	0.06				--	.50***	.84***	.46***	.31***
F4	2.34	0.99	-0.30	0.06					--	.74***	.43***	.11
SITS_T	1.63	0.86	0.29	-0.43						--	.56***	.22**

Anx	1.28	0.81	0.82	0.56						--	.42****
Host	0.72	0.67	1.61	3.05							--

Note. EFA N= 139; CFA N = 236; Gender Females = 0, Males = 1; * $p < .05$; ** $p < .01$; *** $p < .001$.
Skew: Skewness; Krtsis: Kurtosis; F1: Preoccupied Sensitivity; F2: Avoidant Sensitivity; F3: Physiological Sensitivity; F4: Cautionary Sensitivity; SITS_T: Sensitivity to Infection Threats Scale Total Score; Anx: Brief Symptom Inventory Phobic Anxious Symptoms Scale; Host: Brief Symptom Inventory Hostility Symptoms Scale

In the CFA sample, 181 participants were females (77%), while 54 participants were males (23%), and one participant did not report his/her gender. In terms of participants' departments, 109 (46%) participants were in a teaching department, and 127 (54%) were in a social science department. Concerning the study year at university, 125 (53%) of them were freshmen, 51 (22%) were sophomores, and 60 (25%) were junior or senior students. With regard to SES, 30 (13%) participants were on low incomes, 194 (82%) were on middle incomes, and 12 (5%) were on high incomes.

2.2. Instruments

The participants completed a demographics questionnaire along with the newly developed SITS in the first round. A separate set of participants filled the same demographic questionnaire, SITS, and the Brief Symptom Inventory in the second round. The questionnaires required approximately 15 minutes to complete in the second round and slightly shorter in the first round.

The Brief Symptom Inventory (BSI; Derogatis, 1992) is a shortened form of the Symptom Checklist-90. The BSI consists of 53 items rated on a 5-point scale ("0: Never" to "4: Very often") and produces nine subscales. It is a widely used instrument with reliable and valid psychometrics. Şahin and Durak (1994) adapted the scale to Turkish. The present study included only the phobic anxiety and hostility subscales for testing convergent and divergent validity.

Sensitivity to Infection Threats Scale (SITS) initially included 21 items, and later consisted of 20 items after an item was omitted in the EFA. Respondents rated the items on a 5-point Likert-type scale (from "0: Never" to "4: Always") (see Appendix A for the items). Following the suggestions in the field (e.g., Clark & Watson, 2019), the process of scale construction was followed as depicted in Figure 1.

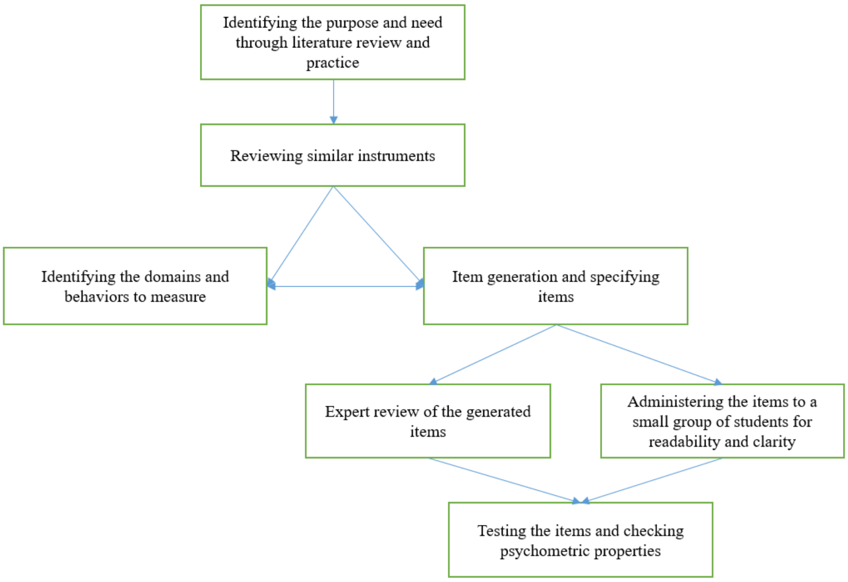

Figure 1. *The SITS's Development Process*

The scale items were generated in several phases. In the first phase, initially, the common measures that could capture increased sensitivity to infection threats were reviewed. The researchers met to discuss the basic components of health sensitivity to infection threats by examining the existing instruments and using dual process theory. In the second phase, the authors independently created two sets of item pools. In the third phase, the item pools were merged. In the fourth phase, three experts in the field were invited to revise the item pool and suggest new items if necessary. The experts had doctoral level training in counselling/clinical psychology, expertise in treating affective and anxiety disorders, and first-hand experience working with clients during the pandemic. The experts' suggestions were mostly about the grammar, language, and clarity of the items, and these were resolved with consensus between the authors. The third expert did not propose new items but suggested that some of the items had interpersonal content, which should be included in the construct as an additional factor. Once the final pool of 21 items was completed, two Turkish grammar experts reviewed the items for grammatical accuracy.

2.3. Procedures

Care was taken to ensure that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. Following the IRB approval of the Social and Human Sciences Ethics Committee at the university, the announcements were made to the students enrolled in five different teaching courses. The recruitment of the participants was completed in two phases, and the participants received course credits. The first phase sample was used to conduct the EFA, while the second phase sample was used to carry out the CFA. There was a one-week interval between these two phases. The data collection was completed in April 2020, during the first peak of the pandemic in Turkey. The participants filled out the questionnaires online. The R (4.0.0. version) *psych* and *cfa* packages were primarily utilized in the analyses. First, descriptive statistics and necessary assumptions were examined. The analyses were run after the necessary assumption checks were confirmed.

3. Results

3.1. The EFA Findings

We followed the five steps suggested by Watson (2017) in conducting the EFA. These steps include the factorability of the intercorrelation matrix, the number of factors to extract and retain, the appropriate factor rotation method, the factor structure, and the clinical significance of the factors. A sample size of 136 participants appears to be a good enough sample size (5 participants per item considering the intercorrelations) (Hair et al., 2019). EFA with principal component analysis was used to explain the underlying common factors consistent with guidelines highlighted in the literature (Hair et al., 2019).

Another issue was to determine the factorability of the intercorrelation matrix (Hair et al., 2019). Inter-item correlations were visually examined, and no violation of this assumption was noticed, with all items showing expected correlation coefficients with the hypothesized factors. The result of Bartlett's test of sphericity was 1956.7 ($p < .001$), the Kaiser-Meyer-Olkin value was 0.88, and the determinant of the correlation matrix did not violate the assumptions for factor analysis. All inter-item correlations ranged from $r = .12$ to $r = .80$, with one correlation being $r = .89$. The latent root and parallel analysis models provided information about the number of factors to extract and retain. Figure 2 displays the results. Based on the literature review and theoretical grounds, a three-factor structure was initially hypothesized. One of our experts suggested the fourth factor. The eigenvalues also suggested a four-factor structure, while the parallel analysis suggested a three-factor structure. Parallel analysis may underestimate the number of factors when testing few factors with small eigenvalues (Lim & Jahng, 2019). Therefore, the number of factors were set to four in the EFA, which was more consistent with the theoretical model and eigenvalues > 1.

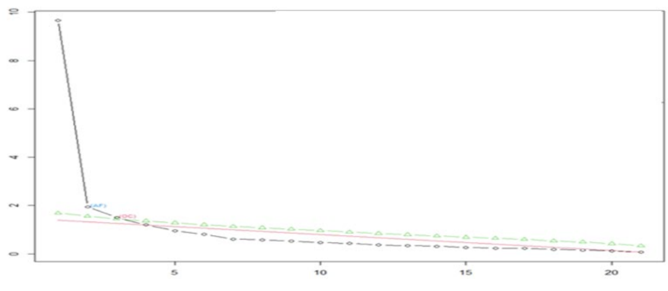

Figure 2. *Number of Factors Across Latent Root Model and Parallel Analysis*

Varimax rotation method maximizes the variance of squared loadings on a factor and helps determine the factor loadings. According to the eigenvalues, the model explained 68% of the variance. Factors 1, 2, 3, and 4 had eigenvalues of 9.67, 1.95, 1.50, and 1.20, respectively. Table 3 presents the factor loadings and the common (h2) and unique (u2) variances. Factor loadings smaller than .45 were suppressed (e.g., Hair et al., 2019). All items had practically significant loading, with a factor loading larger than .50, at least on one factor (Hair et al., 2019).

Table 3. *The EFA factor loadings*

	Factor 1 Preoccupied Sensitivity	Factor 2 Avoidant Sensitivity	Factor 3 Physiological Sensitivity	Factor 4 Cautionary Sensitivity	h2	u2
Item1	0.72				0.63	0.37
Item2	0.73				0.72	0.28
Item3	0.73				0.80	0.20
Item4	0.79				0.76	0.24
Item5	0.65				0.61	0.39
Item6	0.71				0.69	0.31
Item7	0.57	0.54			0.68	0.32
Item8				0.62	0.63	0.37
Item9			0.56		0.51	0.49
Item10				0.79	0.76	0.24
Item11			0.84		0.80	0.20
Item12			0.85		0.84	0.16
Item13			0.82		0.81	0.19
Item14		0.50	0.47		0.60	0.40
Item15			0.61		0.45	0.55
Item16		0.75			0.71	0.29
Item17		0.54			0.53	0.47
Item18		0.86			0.81	0.19
Item19		0.84			0.75	0.25
Item20		0.59			0.62	0.38
Item21				0.69	0.62	0.38

Note: N = 133; h2 = shared variance (commonality); u2 = unique variance
Table 3 does not present the loadings smaller than .45.

The observed data clarified the hypothesized model further. Items 1 through 7 were written for cognitive and emotive dimensions. These items loaded on the first factor. This merge of cognitive and emotive dimensions fits some theorists' view about cognitions and emotions. For example, Damasio (2003) proposes that feeling states are the interpretations of the emotions. This factor was named as Preoccupied Sensitivity as this factor included thinking and feeling about the risk of being infected. The second factor included the items representing interpersonal dimension, which was consistent with the expert review. The second factor provided information about the increased sensitivity about interpersonal contact and was named as Avoidant Sensitivity. Item 7 included worries about getting infections from viruses, bacteria, or microbes. This item loaded on the Preoccupied and Avoidant Sensitivity dimensions. The third factor included increased physiological reactions consistent with the hypothesized model, except for item 14. This factor was named as Physiological Sensitivity. Contrary to the hypothesis, item 14 included physiological reactions in crowded places and loaded on Avoidant Sensitivity as well. Item 14 also had the smallest loading on the factors. Because neither Avoidant nor Physiological Sensitivity was clearly emphasized by the item content, we omitted item 14. The EFA results proposed a fourth factor, which was not hypothesized in the initial model. This fourth factor included three items suggesting cautionary behaviors. These three items were related to searching about the potential risk to one's self, appropriating a healthy diet, and resting and sleeping well when one felt fatigued. These items did not cross-load on any other factor in the scale. Due to the significance of cautionary measures, we retained the fourth factor as Cautionary Sensitivity.

3.2. The CFA Findings

The CFA sample included 236 participants. A maximum likelihood CFA tested the four-factor model. Table 4 presents the standardized and unstandardized estimates, error terms, *Z*-values and correlations between factors. Consistent with the EFA results, item 7 was defined as predicting both Preoccupied and Avoidant Sensitivity.

The goodness of fit statistics provided acceptable support for the construct validity. The Chi-square test was significant and proposed rejection of the proposed model, χ^2 (163) = 418.92, $p < .001$. Schreiber and colleagues (2006) state that the ratio of χ^2 to df smaller than 2 or 3 supports model fit. This ratio was smaller than the criteria (χ^2/df = 2.57). Furthermore, we examined other common measures of goodness of fit indexes, including RMSEA, SRMR, CFI, and TLI. These other model fit indexes supported the model (RMSEA = .08, SRMR = .07, CFI = .92, TLI = .91).

Consequently, the modification suggestions using the Mi (modification indices) statistics being equal or greater than 30 were examined. The results suggested a relationship between item 18 and 19 (Mi = 46), and item 18 and 10 (Mi = 35). These modifications did not improve the model fit indexes considerably, χ^2 (179) = 432.74, $p < .001$, RMSEA = .08, SRMR = .07, CFI = .93, TLI = .92, and the difference between these two models were nonsignificant, $\Delta\chi^2$ (16) = 13.81 (p = 0.612). Considering the previous discussions about the goodness of fit indexes (e.g., Hu & Bentler, 1999; Markland, 2007), the hypothesized model can be deemed as having acceptable model fit.

Table 4. *CFA Factor Loadings and Correlations between Factors*

		b	*se*	*z-value*	*Beta*
Preoccupied	item1	0.81	0.06	12.41	0.717
Preoccupied	item2	0.90	0.07	12.51	0.721
Preoccupied	item3	0.97	0.06	15.32	0.829
Preoccupied	item4	1.05	0.07	15.13	0.822
Preoccupied	item5	0.94	0.07	13.89	0.777
Preoccupied	item6	0.96	0.07	13.36	0.756
Preoccupied	item7	0.84	0.07	11.13	0.690
Avoidant	item7	0.25	0.07	3.69	0.206
Avoidant	item16	1.14	0.07	15.73	0.845
Avoidant	item17	0.83	0.08	10.66	0.640
Avoidant	item18	1.34	0.08	17.39	0.899
Avoidant	item19	1.27	0.08	15.43	0.834
Avoidant	item20	0.99	0.08	12.17	0.708
Physiological	item9	0.52	0.06	7.79	0.486
Physiological	item11	1.02	0.05	18.59	0.927
Physiological	item12	0.99	0.05	19.64	0.956
Physiological	item13	0.91	0.05	16.79	0.872
Physiological	item15	0.69	0.08	8.53	0.526
Cautionary	item8	0.84	0.08	10.30	0.659
Cautionary	item10	0.84	0.08	10.18	0.652
Cautionary	item21	0.81	0.07	11.44	0.718
		Correlations between Factors			
	Preoccupied	Avoidant	Physiological	Cautionary	
Preoccupied	--	0.628	0.711	0.729	
Avoidant		--	0.463	0.771	
Physiological			--	0.523	
Cautionary				--	

Note: N = 236; All z-values are significant at p<.001; All correlations are significant at p < .001; Item 14 was not included in the CFA. Preoccupied = preoccupied sensitivity; avoidant = avoidant sensitivity; physiological = physiological sensitivity; cautionary = cautionary sensitivity.

All factor loadings were significant and showed strong association with the hypothesized factors, ranging from .64 to .96, except for three items. Item 7 had the lowest factor loading on Avoidant Sensitivity. Item 9 had a factor loading of .49, and item 15 had a factor loading of .53 on Physiological Sensitivity. The factors showed moderate to large associations. The weakest association was between Avoidant and Physiological Sensitivity. One can argue that people who avoid interpersonal contact are likely to feel less physiological discomfort while they continue to have preoccupied thinking and exercise cautions.

3.3. Convergent and Divergent Validity

The purpose of the SITS is to measure one's sensitivity in response to infection threats. Therefore, we hypothesized that sensitivity to infection threats would be correlated with phobic anxious symptoms, which include intense fear about a situation or an object, which was infectious disease in our case. We also hypothesized that the sensitivity would be either not associated or weakly associated with hostility. Table 2 presents the correlation coefficients. The correlations of the SITS total score and subscale scores with the BSI

Phobic Anxiety subscale scores displayed moderate to high correlations, while they were not or weakly correlated with Hostility subscale scores (e.g., Cohen, 1992).

3.4. Reliability Findings

The internal consistency and test-retest reliability with a one-week interval were examined for the scale. The internal consistency coefficient for the whole scale was .94, and the internal consistency coefficients for the factors preoccupied, avoidant, physiological, and cautionary sensitivity were .91, .89, .88, and .73, respectively, using the CFA sample. The test-retest reliability assessment was conducted on a sample with 30 participants and indicated a correlation coefficient of $r = .54$, $p = .002$ despite the small sample size. Based on these results, the scale showed good internal consistency and test-retest reliability indicators.

4. Discussion

The psychometric properties of the scale were adequate or better than adequate. Moderate to large internal consistencies and test-retest reliability scores supported the persistence in the scale scores within individuals and across multiple administrations (with one-week interval) despite the small sample size in test-retest reliability analysis. The CFA results also supported the construct validity. The results reinforced the four-factor model, and the fit indexes revealed mediocre or good enough fit statistics. The item loadings on the factors were large, showing that items had a strong association with the factors. Further investigation of the modification indices did not suggest an alternative model, except for the correlation between the error terms in two items.

Previous research produced several instruments to measure individuals' reaction to the risk of getting sick, ranging from health oriented anxiety (Salkovskis et al., 2002) to mental and physical health (e.g., Maruish, 2011) and responses to infection risks (Duncan et al., 2009). With the heightened awareness about individuals' health related behaviours during the current pandemic, there is an increasing need to measure one's sensitivity against infection threats (e.g., Kalkbrenner & Gormley, 2020). In the midst of the current pandemic, the present study suggests the Sensitivity to Infection Threats Scale (SITS) as a measure of increased sensitivity in the domains of cognitive/affective (i.e., Preoccupied Sensitivity), physiological (i.e., Physiological Sensitivity), interpersonal (i.e., Avoidant Sensitivity), and general cautionary (i.e., Cautionary Sensitivity) behaviours relying on dual process theory.

The existing measures in literature examine one's reaction to identified pathogens, such as disgust sensitivity (Haidt et al., 1994) or germ aversion (Duncan et al., 2009). The preoccupied and physiological sensitivity in the present study differ from the existing instruments. The preoccupied sensitivity subscale included one's persistent thinking and feeling about infection threats. The physiological sensitivity subscale consisted of items emphasizing one's physiological experiences. The respondents noted that they tended to experience physiological arousal (e.g., increased cardiovascular and respiratory activity) when they faced or thought about getting sick. Not all illnesses are afflicted from external sources. Therefore, the health sensitivity subscale represents one's heightened awareness about the risk of being infected.

On the one hand, worries and persistent health behaviors of individuals may provide information about or tap into the symptoms of psychological disorders such as illness anxiety (e.g., Salkovskis et al., 2002) or obsessive compulsive behaviors (e.g., Abramowitz et al., 2010). On the other hand, when there is a legitimate risk of being infected, it is desirable to see a level of precautionary behaviors and increased sensitivity over infection risk. For example, Jones and Salathé (2009) reported that emotionally prepared individuals were more likely to engage in behavioral responses during the swine flu outbreak. People who are sensitive to the risk of being infected are more likely to engage in protective behaviors like cautionary sensitivity, while avoidant sensitivity emphasizes one's reactions to interpersonal contact. Consequently, the SITS does not intend to measure maladaptive anxiety but targets adaptive behaviors and emotional state with the purpose of avoiding infections.

4.1. Clinical Implications

The SITS serves to assess one's level of health sensitivity to infection threats. Therefore, a variety of health providers may consider using the SITS. A person's score on the instrument provides information whether he/she is sensitive to the risk of getting sick, and how the individual manages this risk in terms of cognitive/affective, physiological, interpersonal, and cautionary domains. In clinical settings, clinicians may use these scores to design behaviorally oriented intervention strategies as well as to gauge extreme or absent responses. These interventions may include recruiting highly sensitive individuals to informative interventions, psycho-education programs, and individual or group counselling. As discussed earlier in this manuscript, there is a long history of infectious diseases throughout human history, and people are likely to continue to face new viruses, maybe more lethal ones (Rogers et al., 2004). Therefore, proactive health behaviors should be integrated into the interventions as psychoeducation. Clinicians may gauge their clients' thinking/feeling state, physiological arousal, interpersonal reactions, and precautionary behaviors so that the clients may better cope with the stress caused by social limitations (Shultz et al., 2015), the legitimate risks of the viruses, and infection risks (Taylor, 2019; World Health Organization, 2020).

5. Limitations and Recommendations for Future Research

The present study is subject to several limitations to interpreting the results. The first limitation is about the predictive characteristics of the scale. Even though it was hypothesized that health sensitivity is an adaptive strategy in protecting one's health against infection threats, it was not checked whether respondents who had high scores on SITS stayed away from infection or not. Future studies may test whether it is more common to have a COVID-19 diagnosis in people with high SITS. Another limitation is about the research setting and sample characteristics that influence the generalizability of the findings. The present research was conducted at a state university in Turkey. Therefore, the results are limited to young Turkish university students. Future research may replicate the findings with broader samples, including greater diversity in age groups, race/ethnicity, and socio-economic levels. Cross-cultural comparisons of the current findings, particularly in the countries with various levels of exposure to the pandemic, may help understand health sensitivity at a deeper level. Older adults, in particular, may provide valuable information about health sensitive responses as this age group is more vulnerable to diseases, especially COVID-19. Another limitation is related to the theoretical background. It was hypothesized that people would tend to become more sensitive as the organism is inclined to self-preserve. However, another facet of dual process theory argues for habituation with persistent exposure referring to the decreased sensitivity to the stimuli (Groves & Thompson, 1970). Similarly, individuals tend to show a dichotomous reaction (Miller, 1989). They either monitor the signs and become more alert to the risk of being sick or become blunted and avoid disease related information (Miller et al., 2004). The lower scores on SITS may provide information about habituation or blunted response. However, the current measure does not intend to measure this blunted sensitivity, and researchers may develop alternative measures for its assessment in the future. We recommend researchers to consider using the SITS in conjunction with other constructs when they examine the factors affecting behavioral changes.

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