Exploring the Role of Neuroticism and Insecure Attachment in Health Anxiety, Safety-Seeking Behavior Engagement, and Medical Services Utilization: A Study Based on an Extended Interpersonal Model of Health Anxiety

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Abstract
The purpose of this study was to explore an extended interpersonal model of health anxiety, according to which health-anxious individuals are trapped in a vicious circle of health-related reassurance-seeking, alienation from others, and worry about health, while somatic absorption with body sensations, insecure attachment, neuroticism, safety-seeking behaviors, and medical services utilization were also included in the model. Data were collected from 196 Greek university students using standardized instruments. Results indicated that anxious attachment was directly related to absorption (β = .163, p < .05) and alienation (β = .204, p < .05), while avoidant attachment was directly related to absorption (β = −.344, p < .001), reassurance-seeking (β = −.130, p < .05), and alienation (β = .148, p < .05). Neuroticism was positively and significantly associated with all dimensions of health anxiety. Absorption, alienation, and anxious attachment were related to medical services utilization, which, in turn, was related to safety-seeking behaviors (β = .200, p < .01). Neuroticism and anxious attachment were also indirectly and positively associated with worry. Moreover, absorption was positively related to worry and reassurance-seeking, worry was positively related to reassurance-seeking, and alienation was positively related to worry. Study results highlight the key role that interpersonal (e.g., alienation from others) and perceptual factors (e.g., the tendency to focus on bodily sensations) can play in health anxiety maintenance, and the importance of anxious and avoidant attachment in safety-seeking behavior engagement. Implications of the results and suggestions for future research and practice are outlined.

Keywords
health anxiety, insecure attachment, neuroticism, health services utilization

Introduction
Health anxiety refers to an exaggerating fear and persistent worry about one’s health, along with beliefs that one has an illness or may contract a serious illness in the future (Taylor & Asmund, 2004). Health anxiety, as conceptualized by Longley, Watson, and Noyes (2005), consists of four dimensions: alienation, reassurance-seeking, absorption, and worry. Alienation is the interpersonal dimension of health anxiety and refers to one’s tendency to believe one is ill despite evidence to the contrary and that others are unconcerned about one’s health. Although this dimension was originally considered to be a cognitive one, it seems to reflect more interpersonal content rather than cognitive content. Reassurance-seeking is the behavioral dimension of health anxiety. It refers to one’s tendency to seek social support for perceived health concerns. Absorption represents the perceptual dimension of health anxiety and refers to one’s tendency to focus on bodily sensations. The fourth dimension of health anxiety, namely, worry, which is an affective one, refers to one’s tendency to worry excessively about illness and health.

Health anxiety ranges from mild and transient to severe and chronic, and can be present among clinical and nonclinical samples (Langley et al., 2010). It is typical for people to experience mild forms of health anxiety; concerns regarding bodily symptoms may be adaptive and facilitate the early detection of a medical condition (Asmundson, Taylor, &
Cox, 2001). However, continuous and unwarranted health-related worries are distressing and maladaptive. Health anxiety can be a feature of various psychiatric disorders, such as panic disorder, disease phobia, obsessive-compulsive disorder, and somatoform disorders. A severe form of health anxiety is hypochondriasis, characterized by preoccupation with unwarranted fears of having, or the idea that one has, a serious disease, based on a misinterpretation of one or more bodily symptoms (American Psychiatric Association [APA], 2000). The preoccupation persists despite appropriate medical evaluation and reassurance, and causes clinically significant distress or impairment in social, occupational, or other areas of functioning. Excessive health anxiety places a considerable burden on the health care system, leading to needless medical consultations and unnecessary and potentially harmful medical tests or procedures (APA, 2000; Taylor & Asmund, 2004).

The concepts of hypochondriasis and health anxiety have been replaced in the recent release of the Diagnostic and Statistical Manual of Mental Disorders (5th ed.; DSM-5; APA, 2013) by two psychiatric disorders: illness anxiety disorder and somatic symptom disorder. Illness anxiety disorder is the one that actually corresponds to the concept of health anxiety and is characterized by excessive reassurance-seeking, which is more likely associated with anxiety of already having a disease, and related behaviors. Illness anxiety disorder is also characterized by avoidance of seeking health care, which is more likely associated with anxiety about becoming seriously ill in the future. Somatic symptom disorder resembles the current and broad diagnostic concept of hypochondriasis (APA, 2013; Starcevic, 2013).

The present study is based on the interpersonal model of health anxiety (IMHA; Noyes et al., 2003), which asserts that health anxiety represents a maladaptive expression of insecure attachment developed from adverse early caregiving childhood physical illness experiences through learning (Alberts & Hadjistavropoulos, 2014; Stuart & Noyes, 1999). According to attachment theory (Bowlby, 1969, 1988) early intimate relationships, usually with parents, influence one’s subsequent interactions and relationships with other people (e.g., close friends, partners, physicians). Attachment styles reflect the caregiver’s ability to provide protection, comfort, and a secure foundation for the child, especially during times of threat and distress. Although both the conceptualization and measurement of attachment style have varied across studies, most investigators agree that two primary dimensions are involved (Bartholomew & Horowitz, 1991; Brennan, Clark, & Shaver, 1998; Fraley & Shaver, 2000; Fraley & Spieker, 2003). The first dimension, attachment anxiety, concerns worries about rejection and abandonment; the second dimension, attachment avoidance, concerns the degree to which a person feels discomfort with closeness and dependency, or a reluctance to be intimate with others. Low scores on both attachment anxiety and attachment avoidance reflect a secure attachment style. High scores on both dimensions, or high scores on one dimension and low scores on the other, reflect an insecure attachment style. According to Mikulincer and Shaver (2003), each insecure adult attachment style is associated with a specific pattern of interpersonal behavior and emotion regulation when a person perceives a threat, seeks proximity to an attachment figure, and none is available or responsive. Individuals high on attachment anxiety tend to use hyperactivating strategies, characterized by a proximity-seeking effort to elicit support, care, and attention. This strategy involves exaggerating the presence and seriousness of threats and being highly vigilant regarding internal indications of distress. Anxiously attached individuals use methods of coping that consist of intensification of negative emotions, mental rumination on related negative thoughts, self-criticism, negative self-image, and overt displays of distress. Hyperactivating strategies may lead a person to adopt a dependent and needy role that impairs the formation of mature relationships and to feel chronically frustrated because of the unfulfilled need for demonstrations of interest and care. Others may take distance from the demanding person as they feel abused by the person’s endless demands for security and care. Regarding attachment avoidance, individuals high on attachment avoidance tend to use deactivating strategies, which involve denial of attachment needs, avoidance of closeness and intimacy, inhibition of the experience of distress, and an emphasis on self-reliance and independence. Deactivating strategies lead to distancing coping, attempts to maintain interpersonal distance, avoidance and suppression of negative emotional states, and diversion of attention away from threat-related thoughts (Mikulincer & Shaver, 2007, 2008). In summary, attachment insecurity places individuals at risk for a variety of emotional, cognitive, behavioral, and adjustment problems, and has several negative implications for distress management, support seeking, relationship quality, and the appraisal of the self and others.

The IMHA proposes that health anxiety is a type of interpersonal behavior that is motivated by insecure attachment, whereby expressing persistent complaints of illness is used to elicit support and care, and to seek reassurance from others (Stuart & Noyes, 1999). It claims that health anxiety is maintained and exacerbated among insecurely attached individuals through a vicious maladaptive interpersonal cycle of health-related reassurance-seeking, alienation, and worry. This means that when health-anxious individuals are faced with a perceived illness or somatic symptoms, they tend to seek reassurance from others (e.g., family members or physicians), in an effort to evoke comfort and a sense of security. However, their extensive complaints about their health lead others to perceive them as fragile, needy, and difficult to reassure. As a result, excessive reassurance-seeking about somatic complaints is met with reactions of negativity, distancing, and alienation within interpersonal relations (Waldinger, Schulz, Barsky, & Ahern, 2006). This sense of alienation from others, coupled with health-anxious individuals’ perception of
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abandonment, and beliefs that others are unconcerned about their health problems, may trigger more worry about health, which leads again to the need for further reassurance-seeking. Consequently, significant others’ withdrawal of support, as well as health-anxious individuals’ belief that others do not take their health complaints seriously, may be interpreted by these insecurely attached individuals as evidence of rejection or others’ unavailability, which, in turn, may magnify attachment insecurities. While the IMHA does not specify which domain of insecure attachment is most relevant, it has been found that anxious attachment may be more relevant to the IMHA than avoidant attachment (Birnie et al., 2013). Yet, others (e.g., Stuart & Noyes, 2005) maintain that health-anxious individuals are characterized by insecure attachment, typically avoidant (fearful or dismissing), or preoccupied in nature. Birnie et al. (2013) tested the IMHA to check if direct paths between anxious attachment, worry, alienation, and reassurance-seeking existed. Results of their study showed that, with the exception of anxious attachment and reassurance-seeking, which were not significantly related to each other, there were significant positive paths between anxious attachment and worry, anxious attachment and alienation, worry and reassurance-seeking, reassurance-seeking and alienation, and alienation and worry.

Although our study is based on the IMHA, it proposes various extensions to the IMHA, where the perceptual dimension of health anxiety is added to the model, and links are suggested between neuroticism and health anxiety dimensions, as well as between health anxiety dimensions, medical services utilization, and safety-seeking behaviors (Figure 1).

Regarding research hypotheses, first, based on the IMHA, it was expected that health-related reassurance-seeking would lead to health-related alienation, health-related alienation would lead to health-related worry, and health-related worry would lead to health-related reassurance-seeking. Given that significant correlations have been found between the perceptual dimension of health anxiety (absorption) and the other three dimensions of it (Longley et al., 2010; MacSwain et al., 2009; Stewart, Sherry, Watt, Grant, & Hadjistavropoulos, 2008), the role of health-related absorption was also explored in this study. The addition of absorption to the proposed model was supported by previous research results suggesting that health-anxious individuals are more sensitive and intolerant of bodily sensations (Barsky, Wyshak, & Klerman, 1990; Lee, Watson, & Frey Law, 2010). Moreover, persons with elevated health anxiety may automatically interpret and evaluate bodily symptom-related information as being more dangerous than the others see it, indicating an evaluation bias in these persons (Jasper & Witthoft, 2013; Schmidt, Witthoft, Kornadt, Rist, & Bailar, 2013). This may lead to the assumption that absorption is a key dimension in the model of health anxiety and can be used as a starting point for the health anxiety process, given that increased body vigilance can increase health-related worry and may lead to an increased need of health-related reassurance-seeking.

Second, as the IMHA proposes that insecure attachment underlies health anxiety, but it does not specify which domain of insecure attachment is more relevant, in this study we explored the role of both anxious attachment and avoidant attachment in health anxiety. It was expected that both insecure attachment dimensions would be positively related to the dimensions of health anxiety.

Third, neuroticism is a personality trait involving the tendency to experience negative emotions and respond with negative emotions to threat, frustration, and loss (Lahey, 2009). Eysenck and Eysenck (1975) described individuals with high scores in neuroticism as “worriers,” whose main characteristic was a constant preoccupation with things that might go wrong and a strong emotional reaction of anxiety to those thoughts. Persons high in neuroticism tend to express more somatic complaints because they interpret bodily sensations as threats (Williams & Wiebe, 2000), and make negative appraisals, overreact to stress, and are introspective, all of which may contribute to health anxiety (Pennebaker & Watson, 1991). As a result, based on prior research (Longley et al., 2005; Noyes et al., 2003; Sherry et al., 2014), neuroticism was expected to be related to health anxiety dimensions.

Fourth, the relationship between health anxiety and health care utilization was explored. People with health anxiety often make use of health care resources in ways that are mal-adaptive and costly for the health care system (APA, 2000; Bobevski, Clarke, & Meadows, 2016; Ciechanowski, Walker, Katon, & Russo, 2002). As Abramowitz, Schwartz, and Whiteside (2002) claim, health services utilization represents a central way in which individuals with health anxiety

Figure 1. The extended interpersonal model of health anxiety used in the present study.
attempt to gain reassurance that they are medically healthy. Thus, in our study, it was expected that health anxiety would be related to health services utilization. Except from utilizing medical services, to gain reassurance that they are healthy, health-anxious individuals may engage in a variety of safety-seeking behaviors, such as asking friends and family members for their opinion about their health concerns, reviewing medical literature, and checking their body for the presence of any symptoms. These behaviors may include actions designed to detect a perceived threat, to prevent harm, attain certainty, and reduce anxiety. Thus, based on previous research (Fergus & Valentiner, 2011; Olatunji, Etzel, Tomarken, Ciesielski, & Deacon, 2011) it was expected that health anxiety would be related to engagement in safety-seeking behaviors. In this study, the relation between medical services utilization and safety-seeking behaviors was also explored. It was expected that medical services utilization would be related to safety-seeking behaviors, as health-anxious individuals would first visit a specialist to be provided with professional reassurance and then turn to close others or the Internet hoping that they would be given reassurance.

Method

Participants

Questionnaire administration took place during November and December 2013. The study’s protocol was approved by the research committee of the university. Questionnaires were completed during lectures at the university lecture theaters, with the professors’ permission. All participants in the study were informed about the purpose of the study, were told that participation was entirely voluntary, and were assured of the anonymity and confidentiality of all data they provided. Two hundred fifty questionnaires were administered to university students, but 18 of them were not valid, either because participants did not complete them or because the answers given were not as per the instructions of each questionnaire indicated. As a result, 232 undergraduate students (92.8% response rate) from different Greek public higher education institutions participated in our study, studying in departments such as nursing, economics and business, library science, psychology, dentistry, and electrical and mechanical engineering. Given that our sample was non-clinical, we excluded 36 cases who reported suffering currently from a serious mental or physical illness. Thus, the final sample consisted of 196 young adults. Regarding the gender of participants, 114 (58.2%) were women. The mean age was 20.12 years (SD = 2.01; range = 18-29 years).

Measures

Attachment styles were measured by the Experiences in Close Relationships Questionnaire–Revised (ECR-R; Fraley, Waller, & Brennan, 2000). ECR-R is a 36-item self-report measure of general attachment experiences in emotionally intimate relations. The ECR-R is composed of two 18-item subscales measuring anxious attachment (e.g., “I’m afraid that I will lose my partner’s love”) and avoidant attachment (e.g., “I prefer not to show a partner how I feel deep down”). Items were rated on a scale ranging from 1 (strongly disagree) to 7 (strongly agree). The Greek translation of ECR-R was made by Tsagarakis, Kafetsios, and Stalikas (2007), and Cronbach’s alpha coefficients for both subscales were equal to .91.

Health anxiety aspects and hypochondriacal traits were measured by the Multidimensional Inventory of Hypochondriacal Traits (MIHT; Longley et al., 2005). The MIHT is a 31-item self-report measure of four dimensions of health anxiety. Health-related reassurance-seeking (behavioral factor) is measured with eight items (e.g., “I turn to others for support when I do not feel well”), health-related alienation (interpersonal factor) is measured with seven items (e.g., “Few people take my health concerns as seriously as I do”), health-related absorption (perceptual factor) with nine items (e.g., “I am aware of physical sensations”), and health-related worry (affective factor) with seven items (e.g., “Reading articles about disease makes me worry about my health”). It should be noted that health-related alienation did not actually reflect cognitive aspects of health anxiety, but rather interpersonal ones (e.g., “Sometimes others do not seem very concerned about my health complaints”; “The more I talk about my health problems, the less others seem to listen”). MIHT items were rated on a scale ranging from 1 (strongly disagree) to 5 (strongly agree). Cronbach’s alpha coefficients for the MIHT subscales have been reported to be ≥.75 (Longley et al., 2005).

Health care utilization and safety-seeking behaviors were measured by the Medical Utilization Questionnaire (MUQ; Abramowitz, Deacon, & Valentiner, 2007). The MUQ assesses two domains of health-related behaviors associated with health anxiety. The MUQ initially inquires about the utilization of 20 medical services or practitioners (e.g., inpatient hospital stay, dermatologist, cardiologist) over the past 6 months, and if the service has been used, participants provide the number of times they have used the service during that period. Total scores are calculated by summing the number of visits across all providers seen. Then the MUQ asks participants to rate the frequency with which they have engaged in 10 different safety-seeking behaviors (e.g., checked your pulse, accessed health material on the Internet) out of concern for their physical health during the past month. Responses to these items are provided on a 5-point scale, ranging from 0 (never) to 4 (all the time). Scores on all items are summed to yield a total score.

Neuroticism was measured by Eysenck Personality Questionnaire–Neuroticism Scale (EPQ; Eysenck, 1947; Eysenck, & Eysenck, 1968). The EPQ is a questionnaire assessing personality traits and consists of four dimensions: extraversion, neuroticism, psychoticism, and lie. Answers are given on a yes/no scale. The EPQ has been translated into
Greek by Papapetrou (1998). In the present study, only the neuroticism scale was used, which consisted of 22 questions (e.g., “Does your mood often go up and down?”).

**Procedure**

Given that no official Greek translation existed regarding the MUQ and MIHT, the forward-backward translation procedure was applied to translate and culturally adapt the English-language version of these instruments into the Greek language. The instruments were first translated from English into Greek by two independent professionals; these translations were compared and a single translated scale was created through consensus. The scales were then back translated from Greek into English by two other independent professionals. The back-translated versions were compared with the original scales to identify discrepancies. Next the Greek version was administered to 20 randomly selected students. Ten students were also interviewed by the authors using a cognitive debriefing process to ensure the linguistic, semantic, and conceptual equivalence between the two scales. After this process, the final measures were prepared for administration in a larger survey study.

**Statistical Analyses**

To assess whether significant paths among variables were present in the theoretical model, the significance of the effects of the independent variables (i.e., neuroticism, anxious and avoidant attachment) on the dependent variables (i.e., safety-seeking behaviors) transmitted through multiple mediators (i.e., health anxiety dimensions), was tested using path analysis with observed variables. The bias-corrected bootstrap confidence intervals (CIs) for direct, indirect, and total effects were estimated. Bootstrapping is a non-parametric resampling method that can be extended to designs involving effects. In the case of simple mediation, indirect effects equal the product of two unstandardized regression coefficients, one representing the effect of the independent variable on the proposed mediator, and the other representing the effect of the mediator on the dependent variable, controlling for the impact of the independent variable (Frazier, Tix, & Barron, 2004). However, using the product of regression coefficients for making inferences about indirect effects involves implicit assumption that the sampling distribution of the indirect effect is normal. There are reasons to suspect that this assumption does not hold when mediation is present (Shrout & Bolger, 2002). Thus, bootstrapping has been recommended (MacKinnon, Lockwood, & Williams, 2004). To bootstrap the sampling distribution of the indirect effects, the regression coefficients are repeatedly estimated $k$ times with bootstrap samples, each of which contains $n$ cases randomly sampled with replacement from the original sample (i.e., a given case can be selected multiple times), where $n$ is the size of the original sample. This process yields $k$ estimates of the indirect effects of the independent variable on the dependent variable. These $k$ values of the indirect effects are then sorted from low to high, thus enabling the specification of the lower and upper bounds of the desired CI. Bootstrapping was conducted using Analysis of Moment Structures (AMOS) v. 21 (Arbuckle, 2012), generating 2,000 bootstrap samples and 95% bias-corrected CIs for total, direct, and indirect effects. Given that a significant indirect effect might be detected even when the direct or total effect was not statistically significant (Rucker, Preacher, Tormala, & Petty, 2011), the direct, total, and specific indirect effects were tested separately, the latter being tested using Mplus v. 6.12 (Muthen & Muthen, 2010). Correlation matrices of continuous variables were used as input, and estimates were derived applying the maximum likelihood method. In case of multivariate non-normality, the Bollen-Stine bootstrapping approach to model testing and overall model fit assessment was implemented to derive and determine a corrected $p$ value. By drawing a large number of bootstrap samples and constructing an empirical sampling distribution for bootstrap test statistic values, the Bollen-Stine $p$ value represented the proportion of bootstrap samples whose model test statistic (chi-square) exceeded the parent sample’s maximum likelihood test statistic (chi-square) value, signifying that for these samples the model fit was worse than expected. Five indices were used to assess goodness of fit of the model: the root mean square error of approximation (RMSEA) accompanied by its associated 90% CI, the standardized root mean square residual (SRMR), the comparative fit index (CFI), the goodness-of-fit index (GFI), and the Tucker–Lewis index (TLI). Model fit was considered adequate when CFI and GFI were greater than .95, TLI was greater than .95, SRMR was lower than .08, and RMSEA was lower than .06 (Hu & Bentler, 1999). Improvements to model fit were indicated by a decrease in the model Akaike information criterion (AIC; a modification of the standard goodness-of-fit chi-square statistic that adjusts for the complexity of the model), the model Bayesian information criterion (BIC), and the model consistent AIC (CAIC) that takes sample size into account.

**Results**

**Descriptive Statistics**

Nearly half of the participants (49.1%) reported having a very good health, while 21.9% reported an excellent health status, and 26% reported a good health. Regarding internal consistency reliability of questionnaire scales, Cronbach’s alpha coefficients were acceptable for all subscales (ranging from .700 to .871). Table 1 illustrates descriptive statistics and the correlations between main psychological variables. Neuroticism was highly significantly and positively related to anxious attachment, absorption, alienation, worry, and reassurance-seeking. Anxious attachment was highly significantly and positively associated with alienation, worry, and
Table 1. Mean Values, Standard Deviations, Possible Scale Score Ranges, and Pearson’s Correlation Coefficients Between Main Psychological Variables (Listwise n = 196).

|                          | M      | SD     | Possible scale range | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    |
|--------------------------|--------|--------|----------------------|------|------|------|------|------|------|------|------|
| 1. Neuroticism           | 9.16   | 4.66   | 0-22                 | .823 |      |      |      |      |      |      |      |
| 2. Anxious attachment    | 60.26  | 17.22  | 18-126               | .340**| (871)|      |      |      |      |      |      |
| 3. Avoidant attachment   | 55.93  | 16.93  | 18-126               | .023 | .167*| (700)|      |      |      |      |      |
| 4. Absorption            | 31.94  | 4.20   | 9-45                 | .227**| .168*| −.313**| (701)|      |      |      |      |
| 5. Alienation            | 17.30  | 4.72   | 7-35                 | .317***| .311***| .187***| −.022| (779)|      |      |      |
| 6. Worry                 | 20.83  | 4.92   | 7-35                 | .427***| .255**| .019 | .308***| .409***| (732)|      |      |
| 7. Reassurance-seeking   | 27.28  | 5.83   | 8-40                 | .385***| .189**| −.191***| .428***| .261**| .524***| (838)|      |      |
| 8. Safety-seeking behaviors | 7.40  | 5.59   | 0-40                 | .166* | .183*| −.025 | .064 | .202**| .186***| .141*| (845)|      |
| 9. Medical services utilization | 4.81  | 4.63   | 0-24                 | .127 | .278**| −.003 | −.127| .244**| .062 | .081 | .200***|

Note. Diagonal elements (in parentheses) are Cronbach’s alpha coefficients. *p < .05. **p < .01.

reassurance-seeking. Avoidant attachment was highly significantly and negatively associated with absorption and reassurance-seeking, whereas it was positively related to alienation. More frequent utilization of medical services was highly significantly and positively related to anxious attachment and alienation, while more frequent exhibition of safety-seeking behaviors was highly significantly and positively associated with alienation and worry.

Path Analysis

Initially, all paths from the independent variables (e.g., anxious and avoidant attachment, neuroticism) to the dependent variables (e.g., safety-seeking behaviors) passing through the mediators (e.g., health anxiety dimensions) were estimated. Bootstrapping was conducted generating 2,000 usable bootstrap samples and 95% bias-corrected CIs for direct, indirect, and total effects. The model had a good fit to the bootstrap samples and 95% bias-corrected CIs for direct, indirect, and total effects. The model had a good fit to the data, with $\chi^2/df = 8.583/7 = 1.226, p = .284, CFI = .995, RMSEA = .034 (90\% CI = [.000, .099]), SRMR = .027, TLI = .973, GFI = .990$. Degree of parsimony model fit indices included AIC = 84.583, BIC = 209.151, and CAIC = 247.151. Tests of normality indicated significant degree of non-normality (critical ratio value for joint multivariate kurtosis = 8.075). Thus, the Bollen-Stine $p$ value was obtained to assess model fit. This $p$ value was equal to .451, which indicated that the model fitted the data well, using a conventional significance level of .05. However, the key to path analysis and the model-building process was finding an approximation to the saturated model (i.e., a model with zero degrees of freedom and a perfect fit to the data), with fewer parameters to be estimated. Given that various paths appeared to correspond to non-significant relationships, we re-estimated the model retaining only the significant paths from the previous model. The new, trimmed, model (Figure 2) included the same set of variables and had no significant worsening of fit, compared with the initial model, with $\chi^2(16) = 20.409, p = .202, \Delta \chi^2(9) = 11.826, p = .223$. On the basis of overall fit indices that could take into account both model fit and model complexity–parsimony, this trimmed model had lower AIC, BIC, and CAIC values (equal to 78.409, 173.475, and 202.475, respectively), indicating a better fit to the data than the initial model. The variables included in path analysis (e.g., anxious attachment, avoidant attachment, neuroticism) accounted for a large proportion of variance in reassurance-seeking (39.5%) and worry (33.4%), and for a lesser proportion of variance in absorption (17.5%), alienation (16.9%), medical services utilization (12.8%), and safety-seeking behavior (4.0%).

Direct effects in path analysis. As can be seen in Figure 2, the majority of the standardized regression coefficients pertaining to the paths from anxious and avoidant attachment to health anxiety dimensions were found statistically significant. In particular, both anxious and avoidant attachment were significantly related to absorption (perceptual dimension) and alienation (interpersonal dimension), but they were not significantly related to worry (affective dimension), while only avoidant attachment was negatively and significantly associated with reassurance-seeking (behavioral dimension). All standardized regression coefficients of the paths from neuroticism to health anxiety dimensions were found significant at the .05 level (Table 2). In particular, neuroticism was positively related to absorption, reassurance-seeking, worry, and alienation.

Among the paths leading from health anxiety dimensions to medical services utilization, only two were found statistically significant. In particular, both absorption and alienation were related to medical services utilization, but reassurance-seeking and worry were not significantly related to medical services utilization. The path from anxious attachment to medical services utilization was found to be positive and significant. Among the paths leading from health anxiety dimensions to safety-seeking behaviors, none of them was found statistically significant. On the contrary, medical
services utilization was positively and significantly associated with safety-seeking behaviors.

Regarding the relationships between the health anxiety dimensions, absorption was positively related to reassurance-seeking and worry, worry was positively related to reassurance-seeking, alienation was positively related to worry, but reassurance-seeking was not significantly related to alienation ($\beta = .087$, $SE = .091$, $p = .350$).

**Indirect effects in mediation analysis.** To assess whether mediation was present in the model, the significance of the indirect effects was tested using the bias-corrected bootstrap CIs. As shown in Table 3 regarding total indirect (mediated) effects as well as two-path and three-path standardized specific indirect effects, neuroticism and anxious attachment were significantly associated with reassurance-seeking through worry, while they were significantly associated with worry through absorption or alienation. Anxious attachment was also related to safety-seeking behaviors through medical services utilization. Avoidant attachment was associated with reassurance-seeking and medical services utilization via absorption. In addition, absorption was significantly associated with reassurance-seeking through worry and alienation was significantly associated with reassurance-seeking through worry, while alienation and absorption were significantly associated with safety-seeking behaviors through medical services utilization.

**Total effects in mediation analysis.** Regarding significant and noteworthy standardized total effects, avoidant attachment was positively associated with medical services utilization and safety-seeking behaviors, whereas it was negatively related to absorption and reassurance-seeking. Neuroticism was positively related to safety-seeking behaviors, alienation, and worry (Table 2). Moreover, alienation was positively related to reassurance-seeking ($\beta = .126$, 95% CI = [.062, .210], $p < .001$), medical services utilization ($\beta = .161$, 95% CI = [.025, .296], $p = .022$), and safety-seeking behaviors.

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**Figure 2.** Standardized direct path coefficients obtained from path analysis, based on the extended interpersonal model of health anxiety.

*Note.* Non-significant paths are omitted for simplicity of the diagram.

* $p < .05$. ** $p < .01$. *** $p < .001$. 

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behaviors ($\beta = .032$, 95% CI = $[.003, .089]$, $p = .016$). In addition, absorption was negatively related to medical services utilization ($\beta = -.166$, 95% CI = $[-.310, -.012]$, $p = .035$), and safety-seeking behaviors ($\beta = -.033$, 95% CI = $[-.088, -.004]$, $p = .018$).

**Discussion**

The present study tested an extended IMHA model and links between health anxiety dimensions, neuroticism, anxious and avoidant attachment, medical services utilization, and safety-seeking behaviors. Results provided partial support for the model. Specifically, insecure attachment (i.e., anxious and avoidant attachment) appeared to be directly related to two (i.e., alienation and absorption) of the four dimensions included in health anxiety. The positive link between anxious and avoidant attachment and alienation may be due to the fact that insecurely attached individuals with a fear of abandonment and rejection may focus more on the fact that others seem unconcerned about their health, do not take their health concerns seriously, and react with negativity and distancing (Longley et al., 2005). Our finding that anxious attachment was positively related to absorption and alienation was not unexpected, given anxious persons’ exaggerated threat appraisal, clingingness, neediness, and dependency. Moreover, our findings that avoidant attachment was negatively related to reassurance-seeking and absorption, and positively related to alienation, were not unexpected. Avoidant individuals exhibit heightened reliance on distancing coping, heightened perceptions of self-efficacy, blockage in the activation of the caregiving system, and exclusion of threat-related cognitions from awareness. These findings are consistent with that of previous research. Birnie et al. (2013) have found negative correlations between avoidant attachment and health-related reassurance-seeking, as well as no significant correlations between avoidant attachment and health-related worry. Jordan, Williams, and Smith (2015) have also found that avoidant attachment is negatively associated with reassurance-seeking. To further elaborate on this issue, the inverse association found in our study between avoidant attachment and reassurance-seeking and absorption might imply that avoidant attachment could be a protective factor for health anxiety. However, if we closely examine the total indirect effects of avoidant attachment on medical services utilization and safety-seeking behaviors, we can notice that these are significant and positive. Thus, higher scores on avoidant attachment are related to increased engagement in safety-seeking behaviors. In this regard, excessive engagement in safety behaviors is associated with increases in health anxiety and may exacerbate health anxiety by transmitting illness threat information and by leading individuals to infer the presence of danger and maintain strong disease convictions (Olatunji et al., 2011). In addition, avoidantly attached individuals have been found to exhibit a heightened physiological activation to emotional stimuli, although they keep control of their explicit behavior, and tend to avert attention from emotional information (Silva, Ferreira, Soares, & Esteves, 2015). By using deactivating strategies, they leave the suppressed distress unresolved; but the distress can still be indirectly manifested in somatic symptoms. In this way,
avoidant persons may react to stressful stimuli with somatic complaints, leading them to engage in safety behaviors. Contrary to what was expected, insecure attachment (anxious or avoidant attachment) was not directly related to worry. A study by Sherry et al. (2014) showed that anxious attachment was significantly related to hypochondriacal worry, but avoidant attachment was not. Reiser (2013) found that anxious attachment was not predictive of health anxiety, when additional variables (e.g., childhood abuse, emotion regulation, depression, anxiety sensitivity) were simultaneously included in regression models. It seems that anxious or avoidant attachment may demonstrate less influence on certain health anxiety dimensions in the presence of additional variables (e.g., neuroticism).

Neuroticism was positively related to all four health anxiety dimensions. Based on our findings, it seems that neuroticism exerts its effects within the framework provided by the MIHT dimensions, while its effects are not extended to safety behaviors or medical services utilization. Individuals with high levels of neuroticism overreact to stress, respond with negative emotions to stress, and make negative appraisals (Pennebaker & Watson, 1991). This may contribute to

### Table 3. Significant Standardized Parameter Estimates and 95% Bootstrapped CIs for Indirect Effects.

| Independent variable Mediator 1 Mediator 2 Dependent variable | Parameter estimate (SE) | 95% CI LL UL |
|---------------------------------------------------------------|-------------------------|--------------|
| ANX → ALIENT → WORRY → REASS                                |                        | .026* (.011) | .004 .047 |
| AVOID → ABSOR → WORRY → REASS                               |                        | .017* (.008) | .001 .034 |
| NEUR → AVOID → AAEL → WORRY → REASS                         |                        | .031* (.014) | .004 .058 |
| NEUR → WORRY → REASS                                        |                        | .109*** (.033) | .048 .181 |
| AVOID → ABSOR → WORRY → REASS                               |                        | .079*** (.027) | .033 .142 |
| AVOID → AVOID → WORRY → REASS                               |                        | .052* (.024) | .012 .108 |
| AVOID → AVOID → WORRY → REASS                               |                        | .081*** (.031) | .026 .150 |
| NEUR → AVOID → AVOID → WORRY → REASS                        |                        | .016* (.009) | .004 .044 |
| NEUR → WORRY → REASS                                        |                        | .126*** (.037) | .063 .212 |
| NEUR → WORRY → REASS                                        |                        | .189*** (.041) | .118 .281 |
| ABSOR → ABSOR → WORRY → REASS                               |                        | .097*** (.030) | .046 .162 |
| ABSOR → AVOID → REASS                                       |                        | .033* (.020) | .088 .004 |
| ALIENT → AVOID → REASS                                      |                        | .126*** (.037) | .062 .210 |
| ALIENT → AVOID → WORRY                                      |                        | .032* (.022) | .003 .089 |

**Note.** CI = confidence interval; LL = lower limit; UL = upper limit; ANX = anxious attachment; AVOID = avoidant attachment; NEUR = neuroticism; ABSOR = absorption; ALIENT = alienation; WORRY = worry; REASS = reassurance-seeking; SERV = medical services utilization; SAFE = safety-seeking behaviors.

*p < .05. **p < .01. ***p < .001.
increased health anxiety levels, as these individuals tend to spot possible threats for their health even if they are not present (increased absorption). Moreover, they tend to believe that others are unconcerned about their health, hence worry more about their health, and seek reassurance to alleviate their worry. These findings confirm results of previous research (Longley et al., 2005).

Concerning the paths among the four health anxiety dimensions, results showed that, as expected (Jordan et al., 2015), worry was related to reassurance-seeking, while alienation was associated with worry. Contrary to what was hypothesized based on the IMHA, reassurance-seeking did not lead to alienation. This inconsistency may be due to the fact that the items used to measure reassurance-seeking reflect a more passive desire for health-related reassurance-seeking, which stands in contrast to the active, incessant, and aversive reassurance-seeking, as it is conceptualized by the IMHA and other theories (Puri & Dimsdale, 2011). Taking account of the perceptual factor (absorption) in our analysis, results showed that absorption was positively related to worry and reassurance-seeking. One’s tendency to focus on one’s bodily symptoms may lead a health-anxious individual to experience worry about one’s perceived health problems and engage in reassurance-seeking behaviors, while absorption can function as a starting point for the health anxiety process. Significant indirect paths were also found between absorption and reassurance-seeking through worry, and between alienation and reassurance-seeking through worry. These significant indirect paths may indicate that health anxiety dimensions are strongly linked with one another, and that health-related worry (i.e., the affective dimension of health anxiety) may play a major role in holding together the other three components of health anxiety. It seems that worry can act as a significant factor that mediates the effects of alienation and absorption (but also the effects of anxious and avoidant attachment and neuroticism) on reassurance-seeking. The effects exerted by worry are limited within the framework provided by the MIHT dimensions and are not extended to medical services utilization or safety behaviors.

Medical services utilization was found to be related to absorption and alienation, the latter finding being consistent with that reported by Longley et al. (2005) that the cognitive/interpersonal dimension of health anxiety was related to the number of both clinic appointments and clinics attended. Medical services utilization represents a central way in which individuals with high levels of anxious attachment attempt to gain reassurance that they are medically healthy (Abramowitz et al., 2002; Fergus & Valentiner, 2011). This finding may suggest that the interpersonal manifestations of health anxiety are most salient to increased medical services utilization. It was also found that medical services utilization led to safety-seeking behaviors. This may be due to the fact that, by engaging in safety-seeking behaviors, health-anxious individuals hope that they will verify what doctors told them. It should be noted that repetitive safety-seeking behaviors (e.g., checking Internet for information about health-related material, discussing one’s health with friends, checking one’s body for potential signs of illness) may not be adaptive. These behaviors can generate much distress only in individuals characterized by higher levels of health anxiety, compared with that in individuals with lower levels of health anxiety. Finally, medical services utilization was found to be directly and positively related to anxious attachment, a finding that is consistent with previous research showing significant associations between insecure attachment and frequent general practitioner attendance (Taylor, Marshall, Mann, & Goldberg, 2012).

All in all, the extended IMHA confirms that health anxiety is mainly affected by neuroticism (and secondary by anxious and avoidant attachment), and that the interpersonal dimension of health anxiety (alienation), together with the perceptual dimension of it (absorption), coupled with high levels of anxious and avoidant attachment may lead individuals to medical services utilization, which can result in engagement in safety-seeking behaviors. Anxious and avoidant attachment may exert their effects on medical services utilization and safety behaviors through different mechanisms. Based on total effects, while anxious attachment is positively related to safety-seeking behaviors via medical services utilization, avoidant attachment is positively related to medical services utilization through absorption. These findings may suggest potential refinements in the IMHA.

Study Limitations
While there are strengths to the current study (e.g., inclusion of additional variables in the IMHA, examination of potential mediating factors in the relationship between insecure attachment, health anxiety dimensions, and safety-seeking behaviors), there are also a number of potential study limitations to consider. First, only self-report questionnaires were used. Due to this, answers might not reflect the reality of participants’ health condition as some participants might lack insight into their own beliefs, feelings, or behaviors, leading to inaccurate or biased presentation of their functioning (Ganellen, 2007). Moreover, observed correlations between measures might be inflated or deflated due to common method bias in self-report data, representing variance attributable to the measurement method used rather than to the constructs being measured (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Data obtained from multiple sources and methods might offer a more objective view of health anxiety, attachment, neuroticism, medical services utilization, and safety-seeking behaviors. Second, generalizability of our findings from a non-clinical student sample to the general population or to clinical samples is probably limited. As our study was carried out with young university students in good health, the results are restricted to the subclinical phenomenon of elevated health anxiety and cannot necessarily be generalized to the full clinical picture of hypochondriasis.
Future studies could investigate the extended IMHA across other subpopulations, with a wider range and degree of variability in health anxiety severity (e.g., community, primary health care, psychiatric), physical health problems, age, and education. Third, we tested our model using a cross-sectional study design. Thus, assumptions about path directionality and temporal precedence cannot be made. Future studies using the IMHA should employ a longitudinal design. Finally, while the current study was based on the IMHA, the investigation is limited in the extension to other models of health anxiety. Future studies should examine the relationships between health anxiety and safety behaviors (e.g., repeated medical consultations and tests, self-checking of one’s body, compulsive requests for reassurance and repeated searches for reassuring information) in the context of the cognitive-behavioral model (Olatunji et al., 2014; Rachman, 2012; Salkovskis & Warwick, 2001a, 2001b) for a more comprehensive understanding of the mechanisms that underlie, trigger, and maintain health anxiety.

Practical Implications

As our study is based on an IMHA, we can discuss an interpersonal perspective on the treatment of health anxiety. As interpersonal psychotherapy focuses on how problems in interpersonal relations predispose, precipitate, and perpetuate a patient’s distress (Weissman, Markowitz, & Klerman, 2000), it is plausible to assume that it can be helpful for persons with health anxiety. Interpersonal therapy is a validated treatment for a variety of disorders, such as affective disorders, anxiety disorders, and eating disorders. Its targets consist of symptom relief, improved interpersonal functioning, and increased social support (Robertson, Rushton, & Wurm, 2008; Stuart, 2014), using techniques such as role-playing, communication analysis, and examination of interpersonal incidents involving care-seeking behaviors that occur in daily communications, and reinforcement of communication change. Interpersonal therapy would focus on insecure attachment and the interpersonal aspects of health anxiety, such as alienation and reassurance-seeking behaviors, which actually occur within an interpersonal context. Through interpersonal mechanisms, health-anxious individuals can communicate their emotional needs and seek interpersonal support from others to relieve psychological distress (Alberts & Hadjistavropoulos, 2014). By teaching health-anxious individuals (via interpersonal therapy) how to develop close, intimate, relationships with others and communicate more effectively with others, individuals will be assisted in obtaining care more efficiently, reducing their psychological distress (Stuart & Noyes, 2005). This can be achieved, first, by addressing maladaptive patterns of communication (that can lead such individuals to feel misunderstood, isolated, rejected, and unable to communicate that suffering effectively) and then by modifying them. In this way, their sense of alienation and their belief that they are uncared-for persons, and that others are unconcerned with their health problems, will be diminished. Based on our results that indicate that alienation may lead to worry, if health-anxious persons’ sense of alienation is reduced, the same will happen to their health-related worry levels and, consequently, to their persistent and compelling reassurance-seeking behavior. Unfortunately, the majority of studies on interpersonal therapy have focused on the treatment of depression (Markowitz & Weissman, 2004) and somatoform disorders (Stuart, Noyes, Starcevic, & Barsky, 2008). Clearly, further research is needed to investigate the efficacy of interpersonal psychotherapy in the treatment of health anxiety.

Conclusion

This study gives an alternative view of health anxiety as our results highlight the importance of insecure attachment (i.e., anxious and avoidant attachment) both in health anxiety (specifically, absorption and alienation) and in engagement in safety-seeking behaviors. Also, when absorption is added to the model of health anxiety, results show significant links between this health anxiety dimension and worry and reassurance-seeking. This indicates that the addition of this dimension to the model provides us a wider perspective on health anxiety. What is more, results show that neuroticism may play a key role in health-anxious individuals. Finally, this study shows that health-related worry may play a central role in the health anxiety process and that absorption (the tendency to focus on bodily sensations) and dysfunctional interpersonal relationships (denoted by alienation) may initiate the vicious maladaptive cycle maintaining health anxiety. These findings may be used to refine extended models and clinical practice developments in the area of health anxiety.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research and/or authorship of this article.

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