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Accessibility
The Role of the Harm Avoidance Personality in Depression and Anxiety During the Medical Internship

Ching-Yen Chen, MD, Sheng-Hsuan Lin, MD, Peng Li, MD, Wei-Lieh Huang, MD, and Yu-Hsuan Lin, MD

Abstract: To determine whether physicians with harm avoidance (HA) personality traits were more prone to developing increased anxiety and depression during the medical internship.

A prospective longitudinal study of 74 medical interns was carried out using repeated measures of symptoms of anxiety and depression with the Beck Anxiety and Depression Inventories (BAI and BDI) before, at the 3rd, 6th, and 12th months during the internship, and 2 weeks after the internship was completed. Baseline personality was assessed by the Tridimensional Personality Questionnaire with 3 dimensions: novelty-seeking, HA, and reward dependence (RD).

Levels of both depression and anxiety increased (6.4 and 3.4 on scores for BDI and BAI, respectively) during the internship and returned to baseline 2 weeks after it ended. HA scores were significantly correlated with depression and anxiety (0.3 scores on both the BDI and the BAI) and the scores for RD were significantly correlated with anxiety but not with depression. The interaction of HA and point in internship showed no significant differences.

Internship plays a major role in the increase in depression and anxiety. A HA personality was also associated with the development of both depression and anxiety.

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Abbreviations: BAI = Beck Anxiety Inventories, BDI = Beck Depression Inventories and, GEE = generalized estimating equation, HA = harm avoidance, RD = reward dependence, TPQ = Tridimensional Personality Questionnaire.

INTRODUCTION

A number of cross-sectional studies have found the prevalence of depression among physicians in training to be higher than that in the general population,1–7 and related to stress.7,8 Prospective studies of depression during internship have yielded inconsistent findings, as some reported that factors such as female sex and neuroticism were associated with increased depression, but other studies failed to replicate these results.6,8–13 A review of these studies concluded that it was difficult to draw firm conclusions because each of the studies had significant limitations.14

Several studies have examined the correlation between personality traits and stress during internship.13–15 Harm avoidance (HA), a personality trait characterized by excessive worrying, pessimism, shyness, and being fearful, doubtful, and easily fatigued, is suggested to be related to low serotoninergic activity.6,17 Previous research has investigated the link between HA and components of the serotonin system, for example, genetic variation in 5-HTTLPR in the serotonin transporter gene.18 Other studies have suggested a role for that genetic variation in precipitating depression in the face of stress.19 The medical internship provides a rare instance in which the onset of a major stressor can be predicted for a defined population. The subjects’ ages, life styles, and educational backgrounds are similar and they receive a similar stress during internship. Furthermore, medical interns in Taiwan have 2 weeks of free time after their internship; therefore, the internship provides a good model to study the relationship between stress, mental symptoms, and recovery.

The specific aim of the present prospective longitudinal study was to use the diathesis-stress model to identify personality traits associated with the development of depression and anxiety during the stressful internship year.

METHODS AND MATERIALS

Participants

In this prospective longitudinal study, we recruited 74 (46 males, overall mean age, 24.8 ± 1.2) of the 136 medical interns in training at the Chang Gung Memorial Hospital between May 2011 and June 2012. One female intern was lost to follow-up due to nonacademic leave. The participants were volunteers recruited from the 7th year of a medical college student population. All participants were healthy and none showed evidence of mental illness. The assessments took place before and at the 3rd, 6th, and 12th months of their internship. An assessment also took place 2 weeks after the internship ended. During their internship, participants worked an average of 86.7 hours per week, including 33.5 consecutive work hours and an average of 10 on-call duties per month, which they had not done before their internship.12,15 This is equivalent to Accreditation Council for Graduate Medical Education’ guidelines in the United States (https://www.acgme.org/acgmeweb/tabid/271GraduateMedicalEducation/DutyHours.aspx). Participants completed a baseline survey 1 to 2 months before commencing the internship. This survey assessed general demographic factors (age, sex) and the following psychological measures: Tridimensional Personality Questionnaire (TPQ), Attribution-NontCommercial-NoDerivatives License 4.0, where it is permissible to download, share and reproduce the work in any medium, provided it is properly cited. The work cannot be changed in any way or used commercially.

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TABLE 1. Medical Interns’ Tridimensional Personality Questionnaire Scale and Subscale Scores (n = 73)

<table>
<thead>
<tr>
<th></th>
<th>Total (n = 73)</th>
<th>Men (n = 46)</th>
<th>Women (n = 27)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS</td>
<td>13.4 ± 4.4</td>
<td>13.4 ± 4.6</td>
<td>13.4 ± 4.1</td>
</tr>
<tr>
<td>NS1 (exploratory excitability)</td>
<td>3.8 ± 1.8</td>
<td>4.0 ± 1.9</td>
<td>3.4 ± 1.8</td>
</tr>
<tr>
<td>NS2 (impulsivity)</td>
<td>2.5 ± 1.7</td>
<td>2.5 ± 1.7</td>
<td>2.6 ± 1.8</td>
</tr>
<tr>
<td>NS3 (extravagance)</td>
<td>2.9 ± 1.7</td>
<td>2.4 ± 1.7</td>
<td>3.7 ± 1.5</td>
</tr>
<tr>
<td>NS4 (disorderliness)</td>
<td>4.1 ± 1.7</td>
<td>4.4 ± 1.8</td>
<td>3.7 ± 1.6</td>
</tr>
<tr>
<td>HA</td>
<td>19.8 ± 6.8</td>
<td>19.2 ± 7.1</td>
<td>20.7 ± 6.1</td>
</tr>
<tr>
<td>HA1 (anticipatory worry)</td>
<td>4.9 ± 2.8</td>
<td>4.8 ± 2.9</td>
<td>5.1 ± 2.8</td>
</tr>
<tr>
<td>HA2 (fear of uncertainty)</td>
<td>5.1 ± 1.6</td>
<td>4.8 ± 1.6</td>
<td>5.7 ± 1.3</td>
</tr>
<tr>
<td>HA3 (shyness with strangers)</td>
<td>4.1 ± 1.9</td>
<td>4.1 ± 2.0</td>
<td>4.0 ± 1.7</td>
</tr>
<tr>
<td>HA4 (fatigability and asthenia)</td>
<td>5.7 ± 2.7</td>
<td>5.5 ± 2.8</td>
<td>6.0 ± 2.4</td>
</tr>
<tr>
<td>RD</td>
<td>13.5 ± 3.8</td>
<td>13.6 ± 4.1</td>
<td>13.3 ± 3.4</td>
</tr>
<tr>
<td>RD1 (sentimentality)</td>
<td>3.9 ± 1.2</td>
<td>3.9 ± 1.2</td>
<td>3.8 ± 1.0</td>
</tr>
<tr>
<td>RD2 (persistence)</td>
<td>4.1 ± 1.8</td>
<td>4.2 ± 1.9</td>
<td>4.0 ± 1.7</td>
</tr>
<tr>
<td>RD3 (attachment)</td>
<td>6.3 ± 2.7</td>
<td>6.5 ± 2.8</td>
<td>6.1 ± 2.6</td>
</tr>
<tr>
<td>RD4 (dependence)</td>
<td>3.3 ± 1.1</td>
<td>3.2 ± 1.2</td>
<td>3.4 ± 1.0</td>
</tr>
</tbody>
</table>

HA = harm avoidance, NS = novelty-seeking, RD = reward dependence.

*NS = NS1 + NS2 + NS3 + NS4, HA = HA1 + HA2 + HA3 + HA4, RD = RD1 + RD3 + RD4. Data are displayed as mean ± standard deviation.
The present study is the first to investigate the role of the HA personality trait had an association with depression and anxiety during the internship. The increased depression and anxiety during the internship were consistent with the results of a previous large sample study.27 We found that the impact of stress during internship played a more important role than did personality. The depression and anxiety scores significantly increased within the first 3 months, persisted through the internship, and recovered 2 weeks after the internship ended. This is consistent with the concept of a stress-related disorder, such as an adjustment disorder with anxiety and depressed mood. That is, the symptoms of anxiety and depression of an adjustment disorder developed within 3 months after the onset of the stressor and resolved within 6 months of the termination of the stressor;27 however, the average depression (16.9–17.7) and anxiety scores (10.2–10.5) within the range of mild depression and anxiety may not meet the DSM IV criteria of “marked distress that is in excess of what would be expected given the nature of the stressor, or by significant impairment in social or occupational functioning.”27 Furthermore, only 1 female intern in this study was lost to follow-up due to nonacademic leave, so it is conceivable that the increased symptoms of depression and anxiety did not result in significant impairment in occupational functioning.

The distinguishing feature of our study was to determine whether the HA personality trait had an association with depression and anxiety during the internship. HA includes

| TABLE 3. Models of Personality Traits As predictors for Scores on the Beck Depression Inventory During Internship |

<table>
<thead>
<tr>
<th>Effect Before Internship</th>
<th>Model 1</th>
<th></th>
<th>Model 2</th>
<th></th>
<th>Model 3</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate β (SE)</td>
<td>P Value</td>
<td>Estimate β (SE)</td>
<td>P Value</td>
<td>Estimate β (SE)</td>
<td>P Value</td>
</tr>
<tr>
<td>During internship</td>
<td>6.4 (0.9)</td>
<td>&lt;0.001*</td>
<td>6.4 (0.9)</td>
<td>&lt;0.001*</td>
<td>6.4 (0.9)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>After internship</td>
<td>0.5 (1.1)</td>
<td>0.636</td>
<td>0.5 (1.1)</td>
<td>0.636</td>
<td>0.5 (1.1)</td>
<td>0.636</td>
</tr>
<tr>
<td>HAc</td>
<td>0.3 (0.1)</td>
<td>&lt;0.001*</td>
<td>0.3 (0.1)</td>
<td>0.035*</td>
<td>0.3 (0.2)</td>
<td>0.226</td>
</tr>
<tr>
<td>HA1 (anticipatory worry)</td>
<td>0.5 (0.2)</td>
<td>0.014*</td>
<td>0.3 (0.4)</td>
<td>0.412</td>
<td>0.1 (0.3)</td>
<td>0.844</td>
</tr>
<tr>
<td>HA2 (fear of uncertainty)</td>
<td>0.3 (0.4)</td>
<td>0.412</td>
<td>0.1 (0.3)</td>
<td>0.844</td>
<td>0.3 (0.2)</td>
<td>0.226</td>
</tr>
<tr>
<td>HA3 (shyness with strangers)</td>
<td>0.0 (0.1)</td>
<td>0.954</td>
<td>0.0 (0.1)</td>
<td>0.953</td>
<td>0.0 (0.1)</td>
<td>0.905</td>
</tr>
<tr>
<td>HA4 (fatigability and asthenia)</td>
<td>0.0 (0.1)</td>
<td>0.922</td>
<td>0.0 (0.1)</td>
<td>0.923</td>
<td>0.0 (0.1)</td>
<td>0.951</td>
</tr>
<tr>
<td>Sex (male vs. female)</td>
<td>−1.3 (1.0)</td>
<td>0.202</td>
<td>−1.3 (1.0)</td>
<td>0.202</td>
<td>−1.2 (1.0)</td>
<td>0.240</td>
</tr>
</tbody>
</table>

HA = harm avoidance, HAc = centralized harm avoidance, NS = novelty-seeking, NSc = centralized novelty-seeking, RD = reward dependence in the Tridimensional Personality Questionnaire, RDc = centralized reward dependence.

* P < 0.05 indicates a significant influence on BDI score.
shown to correlate with the severity of depression, but
sion during internship provided further evidence for Cloninger
relationship between HA personality and anxiety and depres-
avoidant behaviors decreased when individuals were given
Pharmacological studies have demonstrated that harm
between serotonergic transport and the HA dimension.
other studies have also reporte
d a significant association
was consistent with a similar cross-sectional study.28 The
relevant subscale, the relationship between pessimistic worry
internship resulting in depression and anxiety. The most
appears to be a precursor to the stressful experience of medical
...The relationship between HA personality and anxiety and depres-
sion during internship provided further evidence for Cloninger
neurobiological personality model. HA has not only been
shown to correlate with the severity of depression, but
other studies have also reported a significant association
between serotonergic transport and the HA dimension.
Pharmacological studies have demonstrated that harm
avoidant behaviors decreased when individuals were given
serotonergic agents.21,29 Genetic studies have specifically
shown the 5-HTTLPR gene to be related to neuroticism and
HA.18,28,30 Genetic polymorphism in this serotonin transporter
protein gene located on chromosome 17 increases the prob-
ability that life stress will precipitate depression. Subjects with
at least 1 copy of a less-transcribed 5-HTTLPR-short(S) allele
reported an increase in symptoms of depression during intern-
ship.19,21 Previous studies did not show whether symptoms of
depression improved after the internship ended and our study
did.

Our results supported the viewpoint that HA results in an
"anxiety proneness personality," as a recent review article
showed that almost all anxiety disorders, that is, panic disorder,
obsessive-compulsive disorder, social anxiety, specific phobia,
posttraumatic stress disorder, and generalized anxiety disorder,
were associated with a high HA trait.29 High RD was also
associated with anxiety during the internship, whereas the role
of RD was relatively controversial in anxiety disorders in
previous studies.29 Our study did show that high RD and HA
were correlated with the severity of posttraumatic stress dis-
order.31 RD describes the maintenance and continuation of
behavior, especially sociability, that is rewarded.20 We suggest
that the association between RD and anxiety during internship
may be caused by social interactions, which might easily trigger
interns' anxiety, as new clinical practitioners, during the
medical internship.

Several features demonstrate the strength of this study.
First, we outlined the time course of the development and
recovery of depression and anxiety during the internship.
Second, we quantified the contributions of the HA personality
trait and stress during internship to the development of depres-
sion and anxiety. Third, this study identified symptoms of
anxiety, which had received less attention than interns' depres-
sion in previous studies.32 We also used the BAI, which was
developed to minimize overlap with depression as measured by
the BDI30 so that different features of anxiety and depression
could be identified. In the present study, we demonstrated
the role of HA in both depression and anxiety but that RD was
associated only with anxiety.

There are several methodological limitations that should
be noted when interpreting our findings. First, there may have
been recall bias among interns when reporting symptoms of
depression and anxiety during each 3-month course and the
study lacked a more structured interview that would be needed
to confirm the symptoms of depression and anxiety. Second, all
investigations were self-reported, and a more objective method
would be required to understand the underlying mechanisms.
For example, the measurement of autonomic modulation, such
as heart rate variability, would make it possible to examine the
corresponding physiological reactions in the development of
anxiety and depression during the internship.33,34 Third, we did not
record every intern's physical activity, sleep schedule, actual working hours,
or medical errors, which might have contributed to their
depression and anxiety.15,17

In conclusion, stress during the internship plays a major role
in increasing depression and anxiety. The HA personality was
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anxiety. Our results provide new insights into the characteristics
development of depression and anxiety during internship. We also pointed out
the role of the HA personality when depression and anxiety
among medical interns are considered. A more comprehensive

anticipatory worry, fear of uncertainty, shyness with strangers,
and fatigability and asthenia.21 It is highly correlated with
neuroticism in the Five-Factor Personality Model22 and
appears to be a precursor to the stressful experience of medical
internship resulting in depression and anxiety. The most
relevant subscale, the relationship between pessimistic worry
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### TABLE 4. Models of Personality Traits as Predictors for Scores on the Beck Anxiety Inventory During Internship

<table>
<thead>
<tr>
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<th></th>
<th>Model 2</th>
<th></th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Estimate β (SE) P Value</td>
<td>Reference</td>
<td>Estimate β (SE) P Value</td>
<td>Reference</td>
<td>Estimate β (SE) P Value</td>
</tr>
<tr>
<td>During internship</td>
<td>3.7 (0.9) &lt;0.001*</td>
<td></td>
<td>3.7 (0.9) &lt;0.001*</td>
<td></td>
<td>3.7 (0.9) &lt;0.001*</td>
</tr>
<tr>
<td>After internship</td>
<td>0.4 (1.2) 0.745</td>
<td></td>
<td>0.4 (1.2) 0.746</td>
<td></td>
<td>0.4 (1.2) 0.746</td>
</tr>
<tr>
<td>HAc</td>
<td>0.3 (0.1) &lt;0.001*</td>
<td></td>
<td>0.2 (0.1) 0.095</td>
<td></td>
<td>0.2 (0.1) 0.05</td>
</tr>
<tr>
<td>HA1 (anticipatory worry)</td>
<td></td>
<td></td>
<td>0.3 (0.2) 0.115</td>
<td></td>
<td>0.5 (0.4) 0.181</td>
</tr>
<tr>
<td>HA2 (fear of uncertainty)</td>
<td></td>
<td></td>
<td>0.3 (0.3) 0.279</td>
<td></td>
<td>0.2 (0.2) 0.454</td>
</tr>
<tr>
<td>HA3 (shyness with strangers)</td>
<td></td>
<td></td>
<td>0.3 (0.1) 0.115</td>
<td></td>
<td>0.5 (0.4) 0.181</td>
</tr>
<tr>
<td>HA4 (fatigability and asthenia)</td>
<td></td>
<td></td>
<td>0.2 (0.2) 0.454</td>
<td></td>
<td>0.2 (0.2) 0.454</td>
</tr>
<tr>
<td>HA* before internship (Reference)</td>
<td></td>
<td></td>
<td>0.1 (0.1) 0.464</td>
<td></td>
<td>0.2 (0.2) 0.341</td>
</tr>
<tr>
<td>HA* internship</td>
<td></td>
<td></td>
<td>0.1 (0.1) 0.464</td>
<td></td>
<td>0.2 (0.2) 0.341</td>
</tr>
<tr>
<td>HA* after internship</td>
<td></td>
<td></td>
<td>0.2 (0.2) 0.341</td>
<td></td>
<td>0.4 (0.1) 0.005*</td>
</tr>
<tr>
<td>RDc</td>
<td>0.4 (0.1) 0.002*</td>
<td></td>
<td>0.4 (0.1) 0.002*</td>
<td></td>
<td>0.4 (0.1) 0.005*</td>
</tr>
<tr>
<td>NSc</td>
<td>–0.2 (0.1) 0.185</td>
<td></td>
<td>–0.2 (0.1) 0.185</td>
<td></td>
<td>–0.1 (0.1) 0.303</td>
</tr>
<tr>
<td>Sex (male vs. female)</td>
<td>–1.5 (0.9) 0.111</td>
<td></td>
<td>–1.5 (0.9) 0.112</td>
<td></td>
<td>–1.4 (1.0) 0.160</td>
</tr>
</tbody>
</table>

* P < 0.05 indicates a significant influence on BAI score.

HA = harm avoidance, HAc = centralized harm avoidance, NS = novelty-seeking, NSc = centralized novelty-seeking, RD = reward dependence
study design is needed to validate the phenomenon and to further explore the underlying mechanisms.

ACKNOWLEDGMENTS

The authors gratefully acknowledge the cooperation and friendship of participants and the author’s (PL) classmates. We also thank Tien-Yu Teng for her excellent technical support.

REFERENCES
