Is the Generalized Anxiety Disorder Symptom of Worry Just Another Form of Neuroticism? A 5-Year Longitudinal Study of Adolescents From the General Population

William W. Hale III, PhD; Theo A. Klimstra, MSc; and Wim H. J. Meeus, PhD

Objective: Generalized anxiety disorder (GAD) is a commonly occurring anxiety disorder that many times is characterized by an onset in adolescence and symptoms that increase in severity into adulthood. Due to the persistent nature of the disorder's primary symptom of worry, which appears more related to a personality trait than an anxiety state, the current *DSM-IV* nosology of GAD has been debated. Recently, evidence is accumulating that suggests that the GAD symptom of worry is strongly related to the personality trait of neuroticism. This study investigates whether the GAD symptom of worry and neuroticism are best explained as 1 general factor or as 2 distinct entities in adolescents. Additionally, the interrelation over time between the GAD symptom of worry and neuroticism in adolescents is examined.

Method: Dutch secondary school adolescents from the general community were prospectively studied annually for 5 years. The adolescent population consisted of 923 early adolescents (49% girls) and 390 middle adolescents (57% girls), with mean ages of 12 and 16 years, respectively, on the first measurement wave. At all 5 waves, the adolescents completed self-rated measures of GAD and neurotic symptoms.

Results: Confirmatory factor analyses established that the GAD symptom of worry and neuroticism are 2 distinct entities, and structural equation modeling demonstrated very strong interrelated properties between these 2 entities. These findings did not differ between the adolescent sex and age groups.

Conclusions: The findings suggest that the GAD symptom of worry is more akin to a personality trait than an anxiety state in adolescents, which may hold implications for the current nosology and treatment of GAD.

J Clin Psychiatry 2010;71(7):942–948

Submitted: *July 3, 2009; accepted September 10, 2009.*
Online ahead of print: *May 4, 2010 (doi:10.4088/JCP.09m05506blu).*
Corresponding author: *William W. Hale III, PhD, Utrecht University, Research Center Adolescent Development, PO Box 80.140, 3508 TC Utrecht, The Netherlands (b.hale@uu.nl).*

Generalized anxiety disorder (GAD) is one of the more controversial of the child and adolescent anxiety disorders of the *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition, Text Revision (*DSM-IV-TR*).[1] This disorder was first introduced as overanxious disorder for children and adolescents and as GAD for adults in the *DSM-III*. With the introduction of the fourth edition of the *DSM* (*DSM-IV*), overanxious disorder was merged with GAD. A reason for this merger was the "criteria for overanxious disorder were found to be vague, nonspecific, and to overlap with criteria of other disorders."[2(p1,114)] The primary goal of the new GAD diagnostic criteria in *DSM-IV* was to "modify the definition of the disorder to reflect anxiety symptoms unique to it and try to exclude features that overlapped with other anxiety disorders."[3(p232)] Unfortunately, this reclassification did not immediately resolve the nosologic issues surrounding this disorder, since there is still discussion whether GAD is a "classic" anxiety disorder, or if it is, for example, better categorized with the depressive disorders[4]; however, dissenting opinions have been raised.[5]

Therefore, in order to better determine the nosology of GAD, research is required into the phenomenology of GAD. GAD is one of the most commonly occurring anxiety disorders,[6] with 6-month prevalence rates for young adults ranging between 4%–5%.[5] The symptoms of adolescent GAD, specifically the symptom of worrying, does not appear to be transitory, but seemingly grows in severity over time.[7] In the revision of the *DSM-IV* diagnostic criteria for GAD, the key criterion of excessive worry was retained from the *DSM-III-R*.[8] In a recent study of data from the US National Comorbidity Survey Replication,[8] it was shown that excessive worry is related to an earlier age at onset and longer duration of symptoms in GAD patients. Additionally, this same study found that the lifetime prevalence of GAD increased to almost 40% if the excessive worry criterion was removed.[8] According to the authors, "Taken together, these results suggest that non-excessive worry is associated with a somewhat milder symptom presentation than excessive worry but is characterized by many of the same features and outcomes as the full GAD syndrome."[8(p1,769)] Therefore, it is clear that, in order to better understand the nature of GAD, specific attention should be given to the symptom of worry.

While many times GAD is first diagnosed in early adulthood,[8] it is suggested that GAD actually develops early during midadolescence,[9] leading some to hypothesize that GAD might be the basic anxiety from which other adult anxiety disorders later emerge.[10] When asked when the disorder first occurred, many times GAD sufferers respond that either they had it their entire life or identify themselves with the disorder (eg, "I am a worrier"), leading some researchers to hypothesize that GAD may be an intricate part of the person's personality.[11,12]

Recently, a growing corpus of evidence is accumulating that suggests that the GAD symptom of worry is strongly

related to a person's personality[13] and specifically to the personality trait of neuroticism. The GAD symptom of worry and the characteristics of neuroticism seem to share many similarities.[14] In contrast to the debate surrounding the nosology of GAD, neuroticism is one of oldest and best defined of the personality traits, incorporated into most personality assessments, due in part to its good psychometric properties, construct validity, stability, and cross-cultural validation.[14] In several studies,[15,16] it has been found that neuroticism is a risk factor for the development of GAD. Furthermore, it has been demonstrated that the GAD symptom of worry has more trait-like qualities than the state-like qualities of other anxiety disorders,[17] leading some to question if the GAD symptom of worry is more akin to personality traits than anxiety disorder state symptoms.

In terms of the exact nature of the relationship between GAD and neuroticism, in an adult community sample study, it was found that GAD and neuroticism were so strongly related to one another that the authors suggested that GAD and neuroticism may share common genes that are expressed, at first, phenotypically, as high neuroticism and only later develop into different pathologies.[18] This idea that GAD and neuroticism may share a common genotype received support in a study of adult monozygotic and dizygotic twins that found very high genetic correlations between GAD and neuroticism (averaging .80) and only low correlations with environmental risk factors.[14] While these studies have examined GAD as a *DSM* disorder, hence employing all the symptom criteria, it is conceivable that the GAD symptom of worry may have played an important role in these findings.

When the findings of these studies are taken together, it would appear that neuroticism is a risk factor for GAD and that GAD itself also possesses personality trait-like qualities and may be genetically related to neuroticism. And, as just noted, it is possible that the GAD key criterion of worry may have played an important role in the relationship between the GAD disorder and neuroticism. These findings are important additions to the increasing understanding of the phenomenology of GAD. However, 1 weakness of the aforementioned studies is that all have been conducted with adult samples. As previously mentioned, individuals diagnosed with GAD many times state that they have suffered from the symptoms of GAD their entire lives. In a retrospective study of GAD psychiatric patients, 50% of the patients experienced clinically significant GAD symptoms in either childhood or adolescence.[12] Additionally, it has been found that a person's personality structure seems to be less in flux and begins to stabilize during adolescence,[19] making adolescence an ideal life phase to explore whether the GAD symptom of worry has personality trait-like characteristics such as neuroticism. And, finally, while several of the GAD-neuroticism studies have been conducted with adult psychiatric patients, it has been noted that the onset of adolescent anxiety disorder symptoms occurs as an extension of normal anxieties, which requires research that is devoted to the general population to help prevent referral bias in the clinical setting.[20] Furthermore, longitudinal community samples allow for the exploration of the development of anxiety disorder symptoms like the GAD symptom of worry and problematic personality traits like neuroticism before they have reached clinically significant severity. Hence, in order to better understand the relationship of the GAD symptom of worry (a key criterion for the GAD anxiety disorder diagnosis) to neuroticism (a personality trait), longitudinal studies of adolescents from the general population are crucial.

In light of the aforementioned studies, the objectives of this 5-year, longitudinal study of the relationship between the GAD symptom of worry and neuroticism of adolescents from the general population are 2-fold. The first objective is to determine whether the GAD symptom of worry and neuroticism in adolescents are best explained as 1 general factor, as previous adult studies seem to suggest, or as 2 distinct entities.

However, even if the GAD symptom of worry and neuroticism are found to be 2 distinct entities in adolescents, the exact nature of their relationship for adolescents would still be unclear. Therefore, the second objective is to determine whether the GAD symptom of worry and neuroticism are interrelated in adolescents, as has been found in previous studies of adults. In order to explore this possible interrelation, we employed a longitudinal design, analyzed the correlations between the GAD symptom of worry and neuroticism, and examined whether adolescent neuroticism is predictive of the GAD symptom of worry development in adolescents and vice versa. Additionally, in order to explore this possible interrelation, analysis was given to whether the GAD symptom of worry has either a strong stability rate (as would be expected of a personality trait such as neuroticism) or a low stability rate (as would be expected of anxiety disorder state symptoms) in adolescents.

METHOD

Participants

Data for this study were collected as part of a 5-wave longitudinal research project with a 1-year interval between each of the waves. The longitudinal sample consisted of 1,313 Dutch participants, comprising 2 cohorts of early (n = 923; mean age = 12.4 years, SD = 0.59; girls = 49%) and middle adolescent (n = 390; mean age = 16.7 years, SD = 0.80; girls = 57%) boys and girls from 12 different Dutch junior high and high schools in the Utrecht province of The Netherlands. Sample attrition was 1.2% across waves: in waves 1, 2, 3, 4, and 5, the number of participants was 1,313, 1,313, 1,293, 1,292 and 1,275, respectively. Missing values were estimated in Mplus,[21] using the full information maximum likelihood procedure.

Procedure

The participating adolescents were recruited from various, randomly selected schools in the province of Utrecht, The Netherlands. Of the schools that were approached, 60%

decided to participate. The participating schools represent all Dutch educational levels that are available for the age groups assessed in the current study. Participants and their parents received an invitation letter, describing the research project and goals and explaining the possibility to decline from participation. More than 99% of the approached high school students decided to participate. All participants signed an informed consent form. The questionnaires were completed at the participants' own high school, during annual assessments. Confidentiality of responses was guaranteed. Verbal and written instructions were offered. The adolescents received €10 (approximately US $15) as a reward for every wave they participated in.

Measures

Neuroticism. Neuroticism was assessed with a 6-item neuroticism scale of a shortened 30-item version of Goldberg's Big Five questionnaire.[22] In this instrument, adolescents rate themselves on 6 adjectives (anxious, fearful, fretful, high-strung, irritable, and nervous), using a 7-point Likert scale with a response format ranging from 1 (completely untrue) to 7 (completely true). Previous studies have demonstrated that this measure provides a valid and reliable estimate of adolescent Big Five personality traits such as neuroticism.[23] In the current study, the internal consistency coefficients (Cronbach α) of the neuroticism scale ranged from .79 to .84 across waves.

Generalized Anxiety Disorder Symptoms. The 9-item generalized anxiety disorder symptoms subscale of the original 38-item Screen for Child Anxiety Related Emotional Disorders (SCARED)[24] was employed in this study. Participants rated each symptom item on a 3-point scale: 0 (almost never), 1 (sometimes), and 2 (often). The 9 items strongly emphasize the GAD key criterion of worry. These 9 items are "I worry about things working out for me," "I worry about how well I do things," "I worry about being as good as other kids," "I worry about the future," "I am a worrier," "I worry about things in the past," "I worry about others liking me," "People tell me I worry too much," and "I am nervous." The psychometric properties of the SCARED scales have been shown to be good[20] and the SCARED scales, such as GAD scale, have demonstrated strong sensitivity and specificity when compared with clinical interviews, such as the anxiety disorders section of the Diagnostic Interview Schedule for Children-revised version (DISC-R).[25] In the present research, internal consistency coefficients (Cronbach α) of the GAD scale ranged from .82 to .86 across waves.

RESULTS

Since the first objective is to determine whether the GAD symptom of worry and neuroticism in adolescents are best explained as 1 general factor, as previous adult studies seem to suggest, or as 2 distinct entities, as is the present-day nosology, we applied confirmatory factor analyses (CFAs). To test the second objective, whether the GAD symptom of worry and neuroticism in adolescents are interrelated as has been found in previous studies of adults, we examined this possible interrelation by employing a longitudinal design. We analyzed the correlations between the GAD symptom of worry and neuroticism in adolescents and examined whether adolescent neuroticism is predictive of the development of the GAD symptom of worry in adolescents and vice versa. Additionally, in order to explore this possible interrelation, analysis was given to whether the GAD symptom of worry in adolescents has either a strong stability rate (as would be expected of a personality trait such as neuroticism) or a low stability rate (as would be expected of symptoms of anxiety disorder states). In order to conduct all these analyses in the same design, we relied on a structural equation modeling (SEM) cross-lagged panel model. An advantage SEM has over traditional statistical techniques is that it can combine intercorrelations, intracorrelations, and regressions into the same model.[26]

Confirmatory Factor Analyses

To assess whether the GAD symptom of worry and neuroticism could be regarded as 2 separate constructs, we ran a set of CFAs to test what model had the best fit to our data, either a model in which the neuroticism questionnaire items and the GAD questionnaire items loaded on 1 latent factor or a model in which the neuroticism questionnaire items and the GAD questionnaire items loaded on 2 separate factors. We ran CFAs on all 5 consecutive measurement occasions. This resulted in 5 comparisons of the 1-factor model with the 2-factor model for each wave.

To judge fit of these 2 models, 2 of the best-known SEM model fit indices, the Comparative Fit Index (CFI)[27] and the root mean square error of approximation (RMSEA) were examined. There is general agreement that CFIs of 0.90 or higher and RMSEAs of 0.08 or lower indicate an adequate model fit.[27] Furthermore, we compared the fits of the 2 models by assessing whether differences in CFI exceeded 0.01[28] and differences in RMSEA exceeded 0.015.[29]

In Table 1, comparison between 1-factor and 2-factor models for the entire adolescent population are shown. We found that the 2-factor solutions consistently outperformed the 1-factor solutions (χ^2 difference test significant [$P < .001$]; $\Delta CFI > 0.01$; $\Delta RMSEA > 0.01$). And, as noted in Table 2, the 2-factor solution consistently outperformed the 1-factor solution when applied to the early and middle adolescent boy and girl cohorts (χ^2 difference test significant [$P < .001$]; $\Delta CFI > 0.01$; $\Delta RMSEA > 0.01$). On the basis of these findings, we could conclude that neuroticism and the GAD symptom of worry do not represent 2 forms of the same disorder, but instead they represent 2 separate constructs.

Structural Equation Modeling Cross-Lagged Panel Model

We analyzed the correlations in initial levels (T1 associations) and correlated change of the GAD symptom of worry and neuroticism (T2, T3, T4, and T5 associations),

© Copyright 2010 Physicians Postgraduate Press, Inc.

Table 1. Summary of Model Fit Statistics of Confirmatory Factor Analyses for the Entire Adolescent Population

Model	χ^2	*df*	*P*	CFI	RMSEA	90% CI of RMSEA
Wave 1						
1 Factor	1,321.726	86	<.001	0.80	0.11	0.11–0.12
2 Factors	345.325	85	<.001	0.96	0.05	0.05–0.06
Wave 2						
1 Factor	1,159.960	86	<.001	0.83	0.10	0.09–0.10
2 Factors	565.562	85	<.001	0.92	0.07	0.06–0.07
Wave 3						
1 Factor	1,226.208	86	<.001	0.83	0.10	0.10–0.11
2 Factors	598.260	85	<.001	0.93	0.07	0.06–0.07
Wave 4						
1 Factor	1,159.831	86	<.001	0.86	0.10	0.09–0.10
2 Factors	693.697	85	<.001	0.92	0.07	0.07–0.08
Wave 5						
1 Factor	1,124.422	86	<.001	0.88	0.10	0.09–0.10
2 Factors	727.074	85	<.001	0.93	0.08	0.07–0.08

Abbreviations: CFI = Comparative Fit Index, RMSEA = root mean square error of approximation.

Table 2. Summary of Model Fit Statistics of Confirmatory Factor Analyses at the First Measurement Wave for the Adolescent Cohorts[a]

Model	χ^2	*df*	*P*	CFI	RMSEA	90% CI of RMSEA	AIC
Early adolescent boys							
Model 1: one factor	648.66	86	<.001	0.77	0.13	0.12–0.14	11,789.97
Model 2: two factors	195.76	85	<.001	0.95	0.06	0.05–0.07	11,339.07
Early adolescent girls							
Model 1: one factor	442.17	86	<.001	0.81	0.10	0.09–0.11	12,040.68
Model 2: two factors	210.90	85	<.001	0.93	0.06	0.05–0.07	11,811.41
Middle adolescent boys							
Model 1: one factor	315.08	86	<.001	0.75	0.13	0.11–0.14	5,124.70
Model 2: two factors	148.89	85	<.001	0.93	0.07	0.05–0.09	4,960.51
Middle adolescent girls							
Model 1: one factor	310.07	86	<.001	0.79	0.11	0.10–0.12	7,479.85
Model 2: two factors	181.53	85	<.001	0.91	0.07	0.06–0.09	7,353.30

[a]Confirmatory factor analyses reported in this table were conducted at the first measurement wave, but 2-factor solutions proved to be superior to 1-factor solutions on all subsequent measurement waves. Fit indices of the confirmatory factor analyses on the subsequent measurement occasion can be obtained from the first author on request.

Abbreviations: AIC = Akaike information criterion, CFI = Comparative Fit Index, RMSEA = root mean square error of approximation.

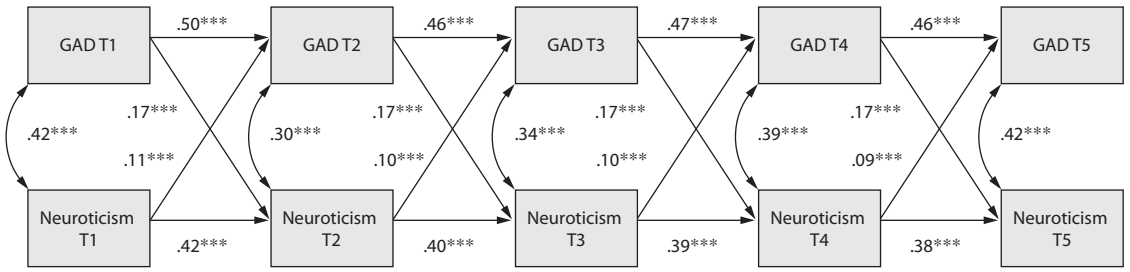
whether levels of neuroticism predicted the levels of the GAD symptom of worry in the subsequent year and vice versa, and the stability of the GAD symptom of worry and neuroticism levels across each of the 5-year intervals. For this purpose, we used an SEM cross-lagged panel model with 5 consecutive annual measurements of the GAD symptom of worry and neuroticism. Before these interrelations between the GAD symptom of worry and neuroticism could be explored, it is essential to determine if the statistical fit of this theoretical model is either strong (indicative of interrelatedness) or weak (little to no relation). We used the previously mentioned criteria to judge model fit.

In conducting SEM cross-lagged panel model analyses, a general rule that applies is the fewer freely estimated parameters, the better.[30] Hence, in an attempt to make our cross-lagged panel model more parsimonious, stability paths were constrained to be equal across waves (ie, the path from T1 GAD symptom of worry to T2 GAD symptom of worry was constrained to be equal to the path of T2 GAD symptom of worry to T3 GAD symptom of worry, and so on), as were the correlated change coefficients (ie, the T2 to T5 associations between GAD symptom of worry and neuroticism) and the regression crosspaths (ie, the paths from T1 neuroticism to T2 GAD symptom of worry, and so on).

The unconstrained model had an excellent fit ($\chi^2_{12} = 18.08$ [$P = .11$], CFI = 1.00; RMSEA = 0.02 [90% CI, 0.00–0.04]), but the fit of the constrained model was just as strong ($\chi^2_{27} = 41.81$ [$P < .05$], CFI = 1.00; RMSEA = 0.02 [90% CI, 0.01–0.03]). There were no significant differences between the CFIs (ΔCFI < 0.01) and the RMSEAs (ΔRMSEA < 0.015). For that reason, we chose the more parsimonious (ie, constrained) model.[29] This model is depicted in Figure 1.

Figure 1 reveals that both the GAD symptom of worry and neuroticism were quite stable across time. Additional χ^2 difference tests revealed that the GAD symptom of worry was somewhat more stable than neuroticism ($P < .001$). Significant associations between the GAD symptom of worry and neuroticism revealed that the 2 were related to one another not only in initial levels of worry and neuroticism (indicated by a significant T1 correlation) but also in changes in the 2 levels (indicated by T2, T3, T4, and T5 associations). Significant regression crosspaths from neuroticism to the GAD symptom of worry and from the GAD symptom of worry to

Figure 1. Cross-Lagged Panel Model of Generalized Anxiety Disorder Symptom of Worry (GAD) and Neuroticism[a,b]



[a]In order to improve model fit, extra stability paths were added.[40] To facilitate interpretability, these extra stability paths (eg, GAD T1→GAD T3, GAD T1→GAD T4, GAD T1→GAD T5, GAD T2→GAD T4, GAD T2→T5, GAD T3→GAD T5, and the same paths for N) are not displayed in Figure 1.
[b]The values on the lines with the arrows represent regression path coefficients (β).
***$P < .001$.
Abbreviations: T1 = wave 1, T2 = wave 2, T3 = wave 3, T4 = wave 4, T5 = wave 5.

neuroticism indicated that neuroticism and the GAD symptom of worry predicted one another across time. Differences in χ^2 tests revealed that crosspaths from the GAD symptom of worry to neuroticism were stronger than those in the inverse direction ($P < .001$).

The model depicted in Figure 1 was then tested for possible sex and age cohort differences. In a 4-group (ie, early and middle adolescent boys and girls) multigroup analysis, model fits for a model in which the crosspaths were constrained to be equal for the 4 cohorts ($\chi^2_{78} = 103.63$ [$P < .05$], CFI = 0.99; RMSEA = 0.04 [90% CI, 0.01–0.06]) and for a less parsimonious, unconstrained model in which the regression could vary between the early and middle adolescent boys and girls ($\chi^2_{72} = 97.84$ [$P < .05$], CFI = 0.99; RMSEA = 0.04 [90% CI = 0.02–0.06]) were similar. Thus, for the more parsimonious, constrained model there were no significant differences between the early and middle adolescent boys' and girls' crosspaths from neuroticism to the GAD symptom of worry and from the GAD symptom of worry to neuroticism. Therefore, sex and age cohort differences were not further explored.

In sum, these findings demonstrate that the GAD symptom of worry and neuroticism are strongly interrelated to one another. However, the GAD symptom of worry is somewhat more stable across waves, and the GAD symptom of worry is a better predictor of neuroticism than neuroticism is for the GAD symptom of worry.

DISCUSSION

In this study the confirmatory factor analyses findings for all 5 yearly measurements establish that, for adolescents, the GAD symptom of worry and neuroticism are 2 separate constructs. This was true not only for the adolescent population as a whole but also for the early and middle adolescent boy and girl cohorts. Additionally, it was demonstrated that the GAD symptom of worry has strong correlations to the personality trait of neuroticism, and that the GAD symptom of worry has a trait-like quality (strong stability coefficients) that was even somewhat stronger than those for neuroticism. Furthermore, not only did neuroticism predict the GAD symptom of worry (in agreement with studies that have shown neuroticism as a risk factor for the development of GAD),[15,16] but the inverse relationship was even stronger (ie, the GAD symptom of worry being a risk factor for neuroticism development). This proved to be the case for the adolescent sample as a whole as well as for the early and middle adolescent boy and girl cohorts. However, it was also found that this prediction did not differ between the adolescent cohorts, indicating that this phenomenon is not age or sex dependent. Hence, the answer to the question, Is the generalized anxiety disorder symptom of worry just another form of neuroticism? would be stated thus: They hold quite similar characteristics for adolescents but are not the same.

These findings may be of potential interest for the present-day deliberations of the classification of GAD in the upcoming *DSM-V*. Some researchers have suggested that GAD should be categorized with the depressive disorders in the *DSM-V* in a new "distress disorders" category.[4] Others have found that GAD is genetically related to neuroticism.[14] As previously noted, GAD often has a long and chronic course that frequently emerges during a person's adolescence. This has led some researchers to postulate that GAD may be an intricate part of the person's personality.[11,12] Additionally, it was also noted that a person's personality structure starts taking on a coherent whole during adolescence,[19] hence making adolescence an ideal life phase to explore whether GAD has personality trait–like characteristics such as neuroticism. However, it was also noted that many of these studies have examined GAD as a *DSM* disorder, hence employing all the symptom criteria, as opposed to also individually focusing on the key symptom criterion of GAD: excessive worry. In a study of data from the US National Comorbidity Survey Replication that also focused on excessive worry as a symptom, it was shown that excessive worry is related to an earlier age at onset and longer duration of symptoms in GAD patients.[8] Additionally, this same study found that the lifetime prevalence of GAD increased to almost 40% if the excessive worry criterion was removed.[8] These findings led the authors

of the study to suggest that nonexcessive worry, while characterized by many of the same features and outcomes as the full GAD syndrome, is associated with a somewhat milder symptom presentation than excessive worry. [8]As can be seen, the reclassification of the GAD diagnostic criteria in *DSM-IV* from the *DSM-III* did not immediately resolve the nosologic issues surrounding this disorder. Since the excessive worry symptom criterion has been suggested to strongly influence the onset and duration of GAD as well affect the estimation of its lifetime prevalence, this study gave specific attention the GAD symptom of worry.

The findings of this study suggest that the GAD symptom of worry might be more related to the personality disorders of the *DSM*'s Axis II symptoms (traits that cause functional impairment and/or distress) than Axis I anxiety disorder symptoms (states that cause functional impairment and/or distress) for adolescents. If the GAD symptom of worry is more related to Axis II personality disorder symptoms than to Axis I anxiety disorder symptoms, then it is possible that the GAD symptom of worry for adolescents may require further definition refinement. In other words, to some people the word *worry* might be defined as having a state-like quality, and, possibly, to other people the word *worry* might be defined as having a trait-like quality. An example of definition refinement is a recent literature review on rumination that specifically made a differentiation between rumination (more past and present oriented) and worry (more future oriented).[31] Hence, it possible that a literature review on the GAD symptom of worry may provide insights into whether it can be used interchangeably as a state and a trait symptom, and such a literature review might help pave the way for future studies on this matter.

It is also possible that, instead of defining worry as a category (either one excessively worries or does not), the GAD symptom of worry for adolescents is better defined as a dimension, such as some researchers have argued that personality disorders might be better defined by the use of personality trait dimensions than by distinct disorder categories.[32] Additionally, one could also make the case that the GAD symptom of worry might be redefined to fit an Axis I state in certain cases and an Axis II trait in other cases, such as is done for obsessive-compulsive symptoms. However, all these redefining suggestions of the nosology of GAD for adolescents would require further study of the relationship between the GAD symptom of worry and neuroticism, preferably in other age groups than those included in this study as well as in twin populations (in order to study the specific genetic and environmental risk factors).

Additionally, it should be noted that the findings of this study could bring insight into the refinement of the present-day psychotherapeutic treatment of the GAD symptom of worry in adolescents. In studies, it has been shown that the recovery rate of the GAD patients when treated is about 30%–40%, and it is even lower for patients with severe symptoms, such as excessive worry.[33] Because one of the primary focuses of the treatment of GAD is the symptom of worry,[34] and since the symptom of worry seems more akin to a personality-like trait than to an anxiety-like state, it is possible that treatment protocols of personality disorders might be more appropriate. While a recent study[35] has demonstrated that both psychodynamic therapy and cognitive-behavioral therapy (CBT) are both effective in the treatment of personality disorders, both therapies share the same characteristic of requiring more therapeutic sessions than most CBT Axis I disorder protocols in order to more fully treat the persistent nature of the symptoms. In the designing of new psychotherapeutic treatments to increase recovery rates, more attention might be given to the persistent nature of the GAD symptom of worry in designing more effective treatment modalities for adolescents. Again, these postulates, like those posed on the *DSM*, would require further research on not only adolescent populations but also other age groups.

In respect to limitations, it should be stated that this study focused on the adolescents' self-report of the GAD symptom of worry and the neuroticism personality trait. Although it is generally accepted that adolescents should be the main informant in the case of anxiety disorder symptoms like the GAD symptom of worry,[36] a multi-informant diagnostic interview, such as the Anxiety Disorders Interview Schedule for Children and Parents,[37] could have been used to study differences to determine the relationship between the self-report symptoms and an actual diagnosis.[9]

Since this study focused only on adolescents' self-report of the GAD symptom of worry and the neuroticism personality trait, the results cannot be readily extrapolated to adolescents from clinical populations. However, referral bias in adolescent clinical populations may limit generalizability and argue that prospective, community studies of adolescents may better characterize the course of adolescent disorders.[20,38,39] Furthermore, longitudinal community samples allow for the exploration of the development of anxiety disorder symptoms and problematic personality traits before they have reached clinically significant severity.

In conclusion, while the GAD symptom of worry in adolescents shares many of the same characteristics of the personality trait of neuroticism, the 2 are quite alike, but are not the same. These findings might have important implications for the future nosology of adolescent GAD as well as the future treatment of this disorder.

Author affiliations: Research Center Adolescent Development, Utrecht University, The Netherlands (all authors).
Author contributions: Dr Hale takes responsibility for the integrity of the data and the accuracy of the data analyses. All authors had full access to all of the data in the study.
Potential conflicts of interest: None reported.
Funding/support: This study was fully funded by the Research Center Adolescent Development at Utrecht University.

REFERENCES

1. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders*, Fourth Edition, Text Revision. Washington, DC: American Psychiatric Association Inc; 2000.
2. Bernstein GA, Borchardt CM, Perwien AR. Anxiety disorders in children and adolescents: a review of the past 10 years. *J Am Acad Child Adolesc Psychiatry*. 1996;35(9):1110–1119.

3. Klein RG, Kaplan-Tancer N, Werry JS. Anxiety disorders of childhood or adolescence. In: *DSM-IV Sourcebook, Vol. 3*. Washington, DC: American Psychiatric Association; 1997:221–240.
4. Watson D. Rethinking the mood and anxiety disorders: a quantitative hierarchical model for DSM-V. *J Abnorm Psychol*. 2005;114(4):522–536.
5. Angst J, Gamma A, Joseph Bienvenu O, et al. Varying temporal criteria for generalized anxiety disorder: prevalence and clinical characteristics in a young age cohort. *Psychol Med*. 2006;36(9):1283–1292.
6. Hunt C, Issakidis C, Andrews G. DSM-IV generalized anxiety disorder in the Australian National Survey of Mental Health and Well-Being. *Psychol Med*. 2002;32(4):649–659.
7. Rynn MA, Franklin M. Generalized anxiety disorder in children and adolescents. In: Nutt D, Rickels K, Stein DJ, eds. *Generalized Anxiety Disorder: Symptomology, Pathogenesis and Management*. New York, NY: Informa HealthCare; 2006:155–164.
8. Ruscio AM, Lane M, Roy-Byrne P, et al. Should excessive worry be required for a diagnosis of generalized anxiety disorder? results from the US National Comorbidity Survey Replication. *Psychol Med*. 2005;35(12):1761–1772.
9. Comer JS, Kendall PC. A symptom-level examination of parent-child agreement in the diagnosis of anxious youths. *J Am Acad Child Adolesc Psychiatry*. 2004;43(7):878–886.
10. Brown TA, Barlow DH, Liebowitz MR. The empirical basis of generalized anxiety disorder. *Am J Psychiatry*. 1994;151(9):1272–1280.
11. Akiskal HS. Toward a definition of generalized anxiety disorder as an anxious temperament type. *Acta Psychiatr Scand*. 1998;98(s393):66–73.
12. Campbell LA, Brown TA, Grisham JR. The relevance of age of onset to the psychopathology of generalized anxiety disorder. *Behav Ther*. 2003;34(1):31–48.
13. Gamez W, Watson D, Doebbeling BN. Abnormal personality and the mood and anxiety disorders: implications for structural models of anxiety and depression. *J Anxiety Disord*. 2007;21(4):526–539.
14. Hettema JM, Prescott CA, Kendler KS. Genetic and environmental sources of covariation between generalized anxiety disorder and neuroticism. *Am J Psychiatry*. 2004;161(9):1581–1587.
15. Kendler KS, Gardner CO, Gatz M, et al. The sources of co-morbidity between major depression and generalized anxiety disorder in a Swedish national twin sample. *Psychol Med*. 2007;37(3):453–462.
16. Hettema JM, Neale MC, Myers JM, et al. A population-based twin study of the relationship between neuroticism and internalizing disorders. *Am J Psychiatry*. 2006;163(5):857–864.
17. Dyck IR, Phillips KA, Warshaw MG, et al. Patterns of personality pathology in patients with generalized anxiety disorder, panic disorder with and without agoraphobia, and social phobia. *J Pers Disord*. 2001;15(1):60–71.
18. Bienvenu OJ, Samuels JF, Costa PT, et al. Anxiety and depressive disorders and the five-factor model of personality: a higher- and lower-order personality trait investigation in a community sample. *Depress Anxiety*. 2004;20(2):92–97.
19. Klimstra TA, Hale WW III, Raaijmakers QAW, et al. Maturation of personality in adolescence. *J Pers Soc Psychol*. 2009;96(4):898–912.
20. Hale WW III, Raaijmakers Q, Muris P, et al. Psychometric properties of the Screen for Child Anxiety Related Emotional Disorders (SCARED) in the general adolescent population. *J Am Acad Child Adolesc Psychiatry*. 2005;44(3):283–290.
21. Muthén LK, Muthén BO. *Mplus User's Guide*. 4th ed. Los Angeles, CA: Muthén & Muthén; 2007.
22. Goldberg LR. The development of markers for the big-five factor structure. *Psychol Assess*. 1992;4(1):26–42.
23. Branje SJ, van Lieshout CF, van Aken MA. Relations between big five personality characteristics and perceived support in adolescents' families. *J Pers Soc Psychol*. 2004;86(4):615–628.
24. Birmaher B, Khetarpal S, Brent D, et al. The Screen for Child Anxiety Related Emotional Disorders (SCARED): scale construction and psychometric characteristics. *J Am Acad Child Adolesc Psychiatry*. 1997;36(4):545–553.
25. Muris P, Merckelbach H, Mayer B, et al. How serious are common childhood fears? *Behav Res Ther*. 2000;38(3):217–228.
26. Kline RB. *Principles and Practice of Structural Equation Modeling*. New York, NY: Guilford Press; 2005.
27. McDonald RP, Ho MH. Principles and practice in reporting structural equation analyses. *Psychol Methods*. 2002;7(1):64–82.
28. Cheung GW, Rensvold RB. Evaluating goodness-of-fit indexes for testing measurement invariance. *Struct Equ Modeling*. 2002;9(2):233–255.
29. Chen FF. Sensitivity of goodness of fit indexes to lack of measurement invariance. *Struct Equ Modeling*. 2007;14(3):464–504.
30. Anderson JC, Gerbing DW. Structural Equation Modeling in practice: a review and recommended two-step approach. *Psychol Bull*. 1988;103(3):411–423.
31. Nolen-Hoeksema S, Wisco BE, Lyubomirsky S. Rethinking rumination. *Perspect Psychol Sci*. 2008;3(5):400–424.
32. Benjamin LS. *Interpersonal Diagnosis and Treatment of Personality Disorders*. 2nd ed. New York, NY: Guilford Publications, Inc.; 2002.
33. Durham RC, Chambers JA, MacDonald RR, et al. Does cognitive-behavioural therapy influence the long-term outcome of generalized anxiety disorder? an 8-14 year follow-up of two clinical trials. *Psychol Med*. 2003;33(3):499–509.
34. Borkovec TD, Newman MG, Castonguay LG. Cognitive-behavioral therapy for generalized anxiety disorder with integrations from interpersonal and experiential therapies. *CNS Spectr*. 2003;8(5):382–389.
35. Leichsenring F, Leibing E. The effectiveness of psychodynamic therapy and cognitive behavior therapy in the treatment of personality disorders: a meta-analysis. *Am J Psychiatry*. 2003;160(7):1223–1232.
36. Stallings P, March JS. Assessment. In: March JS, ed. *Anxiety Disorders in Children and Adolescents*. New York, NY: Guilford Press; 1995:125–147.
37. Silverman WK, Albano AM. *Anxiety Disorders Interview Schedule for Children (DSM-IV)*. San Antonio, TX: Psychological Corporation; 1996.
38. Pine DS, Cohen P, Gurley D, et al. The risk for early-adulthood anxiety and depressive disorders in adolescents with anxiety and depressive disorders. *Arch Gen Psychiatry*. 1998;55(1):56–64.
39. Woodruff-Borden J, Leyfer OT. Anxiety and fear. In: Hersen M, ed. *Clinician's Handbook of Child Behavioral Assessment*. San Diego, CA: Elsevier Academic Press; 2006;267–289.
40. Cui M, Donnellan MB, Conger RD. Reciprocal influences between parents' marital problems and adolescent internalizing and externalizing behavior. *Dev Psychol*. 2007;43(6):1544–1552.

Editor's Note: We encourage authors to submit papers for consideration as a part of our Focus on Childhood and Adolescent Mental Health section. Please contact Karen D. Wagner, MD, PhD, at kwagner@psychiatrist.com.