Prediction of anxiety disorders using the State–Trait Anxiety Inventory for multiethnic adolescents

Earl S. Hishinuma*, Robin H. Miyamoto, Stephanie T. Nishimura, Deborah A. Goebert, Noelle Y.C. Yuen, George K. Makini, Jr., Naleen N. Andrade, Ronald C. Johnson, Barry S. Carlton

Department of Psychiatry, Native Hawaiian Mental Health Research Development Program (NHMHRDP), 4th Floor, John A. Burns School of Medicine, University of Hawaii-Manoa, 1356 Lusitana Street, Honolulu, HI 96813, USA

Received 4 January 2000; received in revised form 27 March 2000; accepted 28 March 2000

Abstract

The purpose of this study was to determine the validity of the State–Trait Anxiety Inventory (STAI) in predicting DSM-III-R anxiety disorders based on the Diagnostic Interview Schedule for Children (DISC, Version 2.3) and using Asian/Pacific Islander adolescents. An overall prevalence rate of 9.19% for generalized anxiety disorder, overanxious disorder, or social phobia was consistent with past studies. As hypothesized, STAI negatively worded (i.e., Factor 2) items were better predictors than positively stated (i.e., Factor 1) items. The STAI State mean was a better predictor of concurrent DISC anxiety disorders as compared to STAI State Factors 1 or 2. In contrast, the STAI Trait Factor 2 (negatively worded) composite was the best predictor for nonconcurrent DISC anxiety disorders as compared to STAI Trait Factor 1 or the overall STAI Trait subscale. Satisfactory predictive-validity values were obtained when using the STAI State mean and Trait Factor 2 composite. Implications of these findings

* Corresponding author. Tel.: +1-808-586-7441; fax: +1-808-586-2940.
E-mail address: earlhish@aol.com (E.S. Hishinuma).
are discussed, including using the STAI as a screening measure for ethnically diverse adolescents. © 2001 Elsevier Science Inc. All rights reserved.

**Keywords:** Adolescents; Asian-Pacific Islanders; Demographics; Ethnicity; Native Hawaiians; State–Trait Anxiety Inventory

1. **Introduction**

Anxiety disorders are some of the most frequently occurring problems for school-aged children and adolescents (Bernstein & Borchardt, 1991; Kashani & Orvaschel, 1990). For example, based on a review of 16 international studies of children and adolescents (ages 6–17 years) conducted since 1986, Costello and Angold (1995) reported prevalences ranging from 5.7% to 17.7% with half of the investigations obtaining rates above 10%. Similar rates have been obtained in more recent studies (e.g., Shaffer et al., 1996).

These are very high rates suggesting that a very large proportion of children and adolescents with anxiety disorders are not being identified and provided appropriate services. For example, in the United States, not more than 1% of the kindergarten to 12th-grade population have been identified under the Individuals with Disabilities Education Act (IDEA) as having an “emotional disturbance” (U.S. Department of Education, 1998). The discrepancy between rates of anxiety disorders and the 1% who have been identified with an emotional disturbance under IDEA is further magnified by the fact that the category of emotional disturbance includes many other emotional–behavioral disorders, including externalizing problems (e.g., oppositional defiant disorder, conduct disorder).

This underestimation of anxiety disorders is likely due to several factors, including: (1) teachers—the primary source of referral for IDEA evaluations (Galagan, 1985; Lloyd, Kauffman, Landrum, & Roe, 1991; Ysseldyke, Vanderwood, & Shriner, 1997)—tend to make referrals due to externalizing behaviors (Algozzine & Ysseldyke, 1986; Pearcy, Clopton, & Pope, 1993) and (2) parents tend to report lower rates or levels of anxiety in their children as compared to self-reports by the children themselves (Bernstein & Borchardt, 1991; Kashani & Orvaschel, 1990; Orvaschel & Weissman, 1986).

These issues highlight the need for screening and treatment programs in school environments and community samples. One of the first steps in such a process is the development and use of effective self-report screening and assessment instruments that are reliable and valid for the population in question (Stallings & March, 1995). Although many anxiety inventories are currently available (Stallings & March, 1995), their application to specific populations remains questionable given that not all instruments have been validated for all children and adolescents.
A major factor of consideration is whether anxiety inventories can be used as screening devices for different cultures (e.g., Friedman, 1997). Although anxiety is said to be universal across all cultures (Good & Kleinman, 1985; Guarnaccia, 1997; Spielberger & Diaz-Guerrero, 1976, 1983, 1986), the contexts in which it is experienced, the interpretations of its meaning, and the responses to it are, like those of other emotions, strongly influenced by cultural beliefs and practices (Kirmayer, Young, & Hayton, 1995, p. 504; see also Guarnaccia, 1997; Malpass & Poortinga, 1986; Manson, 1996). Attention to these types of cultural issues have increased in the past few decades regarding anxiety as well as other psychological disorders (e.g., American Psychiatric Association, 1994; Gaw, 1993; Lonner & Ibrahim, 1989; Mezzich, Kleinman, Febrega, & Parron, 1996), with particular interest in Asian/Pacific Islanders (e.g., Caudill & Lin, 1969; Lebra, 1972; McDermott, Tseng, & Maretzki, 1980; Tseng & McDermott, 1981; Tseng & Streltzer, 1997). Such growing interest nationally is warranted given the recent projected increases in the proportion of minorities. For example, based on the 1980 and 1990 census data, the proportion of Caucasians decreased while the percentage of all major minority groups increased. The largest increase in proportion was found for Asian/Pacific Islanders with over a twofold increase in just 10 years (see Barringer, Gardner, & Levin, 1993). By the middle of the 21st century, the projection is that the US will no longer have a Caucasian majority (Mezzich et al., 1996).

With focus on the Asian/Pacific Islander population, particular concern is noted on the health of Native Hawaiians (“Hawaiians” hereafter), the indigenous inhabitants of the Hawaiian Islands, given that numerous studies have shown Hawaiians to suffer from far more problems associated with socioeconomic status (SES), education, psychological adjustment, and health than other major ethnic groups in Hawaii (e.g., Alu Like, 1985; Department of Business, Economic Development and Tourism, State of Hawaii, 1997; Department of the Attorney General, State of Hawaii, 1997; Kamehameha Schools/Bernice Pauahi Bishop Estate, 1993; Office of Assessment Technology, 1987; Office of Hawaiian Affairs, 1998; Tsark, Blaisdell, & Aluli, 1998). Unfortunately, the topic of anxiety has been a severely underresearched area for Hawaiians and ethnically diverse non-Hawaiians of all ages who reside in Hawaii.

1.1. Purpose

The overall purpose of the present study was to determine the validity of a standardized anxiety inventory in predicting anxiety disorders in Native Hawaiian versus non-Hawaiian adolescents living in Hawaii. Related to this aim was the goal of ascertaining the role that demographic variables play in the use of a standardized inventory as a screener of anxiety disorders. These demographic variables were ethnicity (Hawaiian vs. non-Hawaiian), gender, grade level (9th to 12th), main wage earners’ educational attainment, and main wage earners’ employment status—the latter two being measures of SES. The State–Trait
Anxiety Inventory (STAI, Form X; Spielberger, Gorsuch, & Lushene, 1970) was used to predict the absence or presence of DSM-III-R (American Psychiatric Association, 1987) anxiety disorders based on the Diagnostic Interview Schedule for Children (DISC, Version 2.3; Shaffer et al., 1996).

The STAI, Form X (Spielberger et al., 1970), was utilized given its previous research foundation with other cross-cultural populations and its inclusion in the large-scale study of the Native Hawaiian Mental Health Research Development Program (NHMHRDP). Although the research foundation of using the STAI as a screener for adolescents of Asian/Pacific Islander ancestry was nonexistent, and other studies using adults reported mixed findings (e.g., Kabacoff, Segal, Hersen, & van Hasselt, 1997), the theoretical constructs of the STAI appeared to have potential utility in the prediction of anxiety disorders.

In particular, the STAI is composed of State and Trait subscales. “State anxiety (A-State) is conceptualized as a transitory emotional state or condition of the human organism that is characterized by subjective, consciously perceived feelings of tension and apprehension, and heightened autonomic nervous system activity” (Spielberger et al., 1970, p. 3). “Trait anxiety (A-Trait) refers to relatively stable individual differences in anxiety proneness, that is, to differences between people in the tendency to respond to situations perceived as threatening with elevations in A-State intensity” (p. 3). Both the State and Trait subscales consist of 20 items, some of which are positively worded (i.e., anxiety-absent) and the remaining negatively worded (i.e., anxiety-present). Spielberger, Vagg, Barker, Donham, and Westberry (1980) theorized that anxiety-absent items would be more sensitive to low levels of anxiety, whereas anxiety-present items would be more sensitive to high levels of anxiety. Previous research has demonstrated a relatively robust four-factor solution to the 40 STAI items: State anxiety-absent (State Factor 1), State anxiety-present (State Factor 2), Trait anxiety-absent (Trait Factor 1), and Trait anxiety-present (Trait Factor 2) (Hishinuma, Miyamoto, Nishimura, Nahulu, Andrade et al., 2000). This four-factor solution was generally confirmed with the present population of adolescents from Hawaii (Hishinuma, Miyamoto, Nishimura, Nahulu, Andrade et al., 2000).

Examination of the four factors as well as demographic variables is necessary in the present study because differential results have been obtained as a function of the type of STAI composite (Hishinuma, Miyamoto, Nishimura, & Nahulu, 2000). For example, a significant main effect of ethnicity was obtained on the overall State and Trait measures, with subsequent t tests indicating that Japanese adolescents scored significantly lower than Hawaiian high school students. However, when the other three demographic variables (i.e., gender, grade level, main wage earners’ education) were simultaneously considered in the prediction model, ethnicity was no longer a significant predictor of overall STAI scores. In general, females scored higher than males, and the higher the main wage earners’ educational attainment, the lower the STAI scores. In addition, two interaction effects were statistically significant. First, the difference between females and
males (with females having higher levels of anxiety than males) was larger for State Factor 1 as compared to State Factor 2, but the reverse was found for the Trait factors (i.e., larger female–male difference was found for Factor 2 as compared to Factor 1). Second, the Japanese adolescents scored lower on State Factor 1 than the Hawaiian, Caucasian, and “other” ethnic groups (the latter was composed of high school students who were neither full-/part-Hawaiian, Caucasian, Japanese, nor Filipino). However, on State Factor 2, the Japanese and Caucasians scored significantly lower than the Hawaiians. Therefore, with reverse scoring taken into account, the Caucasian adolescents scored relatively high on anxiety for the positively worded items, but scored relatively low on anxiety for the negatively worded items.

The DISC (Version 2.3; Shaffer et al., 1996) served as the criterion for anxiety disorders. A proportion of the participants were administered the STAI and DISC on the same day (i.e., concurrently), while the remaining students were administered the DISC some time after the STAI (i.e., nonconcurrently).

1.2. Hypotheses

Three central hypotheses were examined. First, the STAI composites will significantly predict the presence and absence of DISC anxiety disorders, with the possibility that Factor 2 (anxiety-present) composites will be better predictors given their supposed sensitivity to high levels of anxiety.

Second, the State composites (as compared to Trait measures) will better predict DISC anxiety disorders when the administration of the STAI and DISC was concurrent. In contrast, the Trait composites (as compared to State measures) will better predict DISC anxiety disorders under nonconcurrent administration procedures.

Third, after STAI composites are entered into the prediction model, demographic variables will be statistically significant in predicting unique variance in DISC anxiety disorders. However, a substantial amount of unique variance will not be accounted for by the demographic variables, including ethnicity (i.e., Hawaiian vs. non-Hawaiian).

2. Method

2.1. Participants

The present study utilized archived data from the Hawaiian High Schools Health Survey of the NHMHRDP (e.g., Andrade et al., 1994). The Hawaiian High Schools Health Survey was modeled after the Sequoia High School Health Survey in collaboration with the National Center for American Indian and Alaska Native Mental Health Research Program (Ackerson, Wiegman-Dick, Manson, & Baron, 1990). The NHMHRDP’s cross-sequential project surveyed over 7000
high school students from three of the Hawaiian Islands during the 1991–1992 to 1995–1996 school years. Two schools were located in rural areas, two in suburban districts, and one in an urban city. The sample’s median annual income was lower than the median income of the State of Hawaii (Department of Education, State of Hawaii, 1997–1998).

A smaller proportion of the sample was involved in the DISC study (see also Nishimura et al., in press; Prescott et al., 1998). A total of 29 adolescents “at risk” for adjustment difficulties were administered the DISC in the first year (1993) of interviews given the low projected rates on many of the diagnostic categories and a need for positive diagnoses for the development of prediction models. The remaining participants were randomly selected from the available pool of students who had been administered the paper-and-pencil Hawaiian High Schools Health Survey. A total of 619 DISCs were administered as follows: 149 (24.1%) in 1992–1993; 117 (18.9%) in 1993–1994; 223 (36.0%) in 1994–1995; and 130 (21.0%) in 1995–1996.

Data from 117 (18.9%) of the 619 were not included in the analyses due to missing information (regarding ethnicity, gender, grade level, main wage earners’ education level, main wage earners’ employment status, or STAI State items) or due to invalid STAI State or Trait composites. In the case of the latter, the STAI State and Trait subscales consist of both positively and negatively worded items. A composite was considered invalid when a given participant responded to all 20 items for either the State or Trait subscale with one of the extreme ratings prior to reverse scoring. In addition, the composite scores for Filipino males were considered invalid for the purposes of the present study given that previous research suggested that a different interpretation of some of the items of the STAI (e.g., “I feel content,” “I am regretful,” “I feel rested,” “I am content,” and “I am inclined to take things hard”) may have occurred for this group (Hishinuma, Miyamoto, Nishimura, Nahulu, Andrade et al., 2000).

Sample bias due to the exclusion of these students was evaluated by comparing measures of anxiety between those who were included and those who were excluded from the study. No significant difference was found between the proportions diagnosed with DISC anxiety for adolescents included (62 [12.4%] of 502) and excluded (13 [11.8%] of 110; $\chi^2[1] = 0.0, P = .88$, odds ratio=0.95, odds ratio 95% confidence interval = 0.50–1.80) based on a univariate logistic regression analysis. Nonsignificant results were also obtained on available STAI State and Trait measures between included (State: mean=0.94, S.D. = 0.56, $n = 480$; Trait: mean=1.36, S.D. = 0.54, $n = 126$) and excluded participants (State: mean=0.94, S.D. = 0.50, $n = 106$; Trait: mean=1.22, S.D. = 0.65, $n = 1$) based on $t$ test comparisons (State: $t[584]=0.05, P = .96$; Trait: $t[145]=1.04, P = .30$).

Less than 1% of the population of Hawaii consist of Hawaiians of nonmixed ancestry (Department of Business, Economic Development and Tourism, 1995). Therefore, a student was defined as being Hawaiian if either parent had any Hawaiian ancestry. Anyone with only Portuguese ancestry was categorized as a Caucasian. Persons of Filipino descent are frequently of Chinese, Spanish, or
Malay ancestry, and therefore, they were categorized as being Filipino. An adolescent with only Japanese ancestry was considered to be Japanese for the purposes of this study. Students in the “other” category, included those of infrequent nonmixed ethnic groups in Hawaii (i.e., African American, American Indian/Alaska Native, Chinese, Hispanic, Korean, Puerto Rican, Samoan, and Tongan). Given the relatively small samples sizes for the non-Hawaiian subgroups, they were combined for statistical purposes.

Table 1 describes the Hawaiian versus non-Hawaiian samples based on gender, grade level, main wage earners’ education level, and main wage earners’ employment status. In addition to the 294 (58.6%) Hawaiians, the non-Hawaiians consisted of 17 (3.4%) Caucasians, 17 (3.4%) Filipino females, 59 (11.8%) Japanese, 109 (21.7%) mixed/non-Hawaiians, and 6 (1.2%) of those with “other” nonmixed ethnicities. In general, there were disproportionately more 10th graders and fewer 11th graders for Hawaiians as compared to non-Hawaiians, and the non-Hawaiians’ main wage earners’ education level was higher than for the Hawaiian adolescents.

Table 1
Description of sample by ethnic group, gender, grade level, and socioeconomic status

<table>
<thead>
<tr>
<th>Demographic variable</th>
<th>Ethnic group</th>
<th>Hawaiian</th>
<th>Non-Hawaiian</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Level</td>
<td>n</td>
<td>%a</td>
<td>n</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>294</td>
<td>58.6</td>
<td>208</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>131</td>
<td>44.6</td>
<td>88</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>163</td>
<td>55.4</td>
<td>120</td>
</tr>
<tr>
<td>Grade level</td>
<td>9th</td>
<td>69</td>
<td>23.5</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>10th</td>
<td>75</td>
<td>25.5</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>11th</td>
<td>72</td>
<td>24.5</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>12th</td>
<td>78</td>
<td>26.5</td>
<td>59</td>
</tr>
<tr>
<td>Main wage earners’ education level</td>
<td>Less than high school</td>
<td>25</td>
<td>8.5</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>High school or GED</td>
<td>110</td>
<td>37.4</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td>Some college</td>
<td>70</td>
<td>23.8</td>
<td>66</td>
</tr>
<tr>
<td></td>
<td>College graduate</td>
<td>89</td>
<td>30.3</td>
<td>99</td>
</tr>
<tr>
<td>Main wage earners’ employment status</td>
<td>Unemployed, welfare, disability</td>
<td>22</td>
<td>7.5</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Employed/part-time, retired</td>
<td>35</td>
<td>11.9</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Self-employed/ own business or farm</td>
<td>27</td>
<td>9.2</td>
<td>27</td>
</tr>
<tr>
<td></td>
<td>Employed/full time</td>
<td>210</td>
<td>71.4</td>
<td>153</td>
</tr>
</tbody>
</table>

χ² for main effects: ethnicity (14.7, df=1, P<.0001); gender (8.2, df=1, P<.01); grade level (6.7, df=3, P=.08); earners’ education (98.0, df=3, P<.0001); earners’ employment (601.1, df=3, P<.0001). χ² for interaction effects with ethnicity (Hawaiian vs. non-Hawaiian): gender (0.3, df=1, P=.62); grade level (9.7, df=3, P<.05); earners’ education (35.2, df=3, P<.0001); earners’ employment (4.4, df=3, P=.22).

a Percents are based on rows for the total, but based on columns for all other demographic variables.
2.2. Measures

2.2.1. Demographics

Ethnicity (as described earlier), gender, grade level, main wage earners’ education level, and main wage earners’ employment status were based on self-reported data from the Hawaiian High Schools Health Survey. The main wage earners’ education was coded as follows: 1 (less than high school), 2 (high school graduate), 3 (some college), and 4 (college graduate). The main wage earners’ employment status was coded as follows: 1 (unemployed, on welfare, or on disability), 2 (employed/part-time or retired), 3 (self-employed/own business or farm), and 4 (employed/full-time).

2.2.2. State–Trait Anxiety Inventory

The STAI (Form X; Spielberger et al., 1970) was utilized as the measure of anxiety symptoms. For the 20 State items, the adolescents were asked to, “Circle the number that best describes how you feel now” with the following four-point intensity scale: 1 (not at all), 2 (somewhat), 3 (moderately so), and 4 (very much so). For the 20 Trait items, the students were asked to, “Circle the number that best describes how you generally feel” with the following four-point frequency scale: 1 (almost never), 2 (sometimes), 3 (often), and 4 (almost always). All anxiety-absent (positively worded) items were reverse scored (i.e., reversed score = 5 – original score). To make the item ratings range from 0 to 3, 1 was subtracted from all ratings.

Support for the psychometric properties of the STAI has been extensive (e.g., Spielberger, 1983, 1989; Spielberger & Diaz-Guerrero, 1976, 1983, 1986; Spielberger et al., 1970) and the STAI has received favorable reviews (e.g., Dreger, 1975; Guthrie & Lonner, 1986; Katkin, 1975; Sharma, 1977). The STAI has been translated into over 40 languages (Dana, 1995; Spielberger & Diaz-Guerrero, 1976, 1983, 1986) and is “the most widely used device to measure ‘anxiety’ across cultures” (Lonner & Ibrahim, 1989, p. 317).

Based on a previous study by Hishinuma, Miyamoto, Nishimura, Nahulu, Andrade et al., 2000 using the larger 1992–1993 data set from the NHMHRDP, a four-factor solution of the STAI was supported based on a series of confirmatory factor analyses. These four factors were: (1) State Factor 1, 10 positively worded items, anxiety-absent; (2) State Factor 2, 10 negatively worded items, anxiety-present; (3) Trait Factor 1, 7 positively worded items, anxiety-absent; and (4) Trait Factor 2, 12 of the 13 negatively worded items, anxiety-present. It should be noted that Trait Factor 2 did not include Item 14 (“I try to avoid facing a crisis or difficulty”) because of its poor psychometric properties. In addition, the validity of the scores derived from the STAI was questionable for Filipino male adolescents. Based on a series of past studies by the NHMHRDP, satisfactory internal consistency (Cronbach’s $\alpha = .83–.93$ for various composites; Hishinuma, Miyamoto, Nishimura, Nahulu, Andrade et al., 2000), test–retest stability ($r = .54$ for overall score; NHMHRDP, 1999), and
validity were obtained (Goebert et al., 2000; Makini et al., 1996; Nahulu et al., 1996; NHMHRDP, 1999; Yuen et al., 1996).

Spielberger (1983) and Spielberger et al. (1980) revised Form X and called the new version Form Y. The reasons for revising the STAI were: (1) to come up with a “purer” measure of anxiety that “... would provide a firmer basis for discriminating between feelings of anxiety and depression ...” (Spielberger, 1983, p. 7); (2) “To replace several items for which the psychometric properties were found to be relatively weak for younger, less-educated persons and individuals from lower socioeconomic status groups” (Spielberger, 1983, p. 7); and (3) “To improve the factor structure of the T(Trait)-Anxiety scale by achieving a better balance between anxiety-present (e.g., ‘I feel nervous and restless’) and anxiety-absent (e.g., ‘I feel pleasant’) items” (Spielberger, 1983, p. 8). “... although Form Y has superior psychometric properties, research based on Form X can be readily generalized to Form Y. For most clinical and research applications, the two forms may be considered essentially equivalent for the assessment of anxiety. In differentiating between anxiety and depression, however, Form Y should be used ...” (Spielberger, 1983, p. 23). The correlation between Forms X and Y range from .96 to .98 (Spielberger, 1983).

Despite this high correspondence between Forms X and Y, there remains the possibility that Form X measures the additional construct of depression. Therefore, a variant of Form Y was also examined. Although the present study did not utilize Form Y, common items from Form X were used to derived “Partial Form Y” composite scores, as follows: (1) State Factor 1, 8 of the 10 original Form X items, anxiety-absent; (2) State Factor 2, 5 of the 10 original Form X items, anxiety-present; (3) Trait Factor 1, same 7 original Form X items, anxiety-absent; and (4) Trait Factor 2, 7 of the 12 original Form X items, anxiety-present. It should be noted that Partial Form Y Trait Factor 1 consists of the same items as Form X Trait Factor 1.

There were a total of 12 STAI composite scores: (1) Form X, State, Factor 1; (2) Form X, State, Factor 2; (3) Form X, State, overall; (4) Form X, Trait, Factor 1; (5) Form X, Trait, Factor 2; (6) Form X, Trait, overall; (7) Partial Form Y, State, Factor 1; (8) Partial Form Y, State, Factor 2; (9) Partial Form Y, State, overall; (10) Partial Form Y, Trait, Factor 1; (11) Partial Form Y, Trait, Factor 2; and (12) Partial Form Y, Trait, overall. All factor composites were based on the mean of the respective items, and all overall scores were based on the mean of the two respective factor composites.

2.2.3. Diagnostic Interview Schedule for Children

The DISC (Shaffer et al., 1996) uses a structured interview format and can be administered by trained lay interviewers. The Computerized Version 2.3 is based on DSM-III-R criteria (American Psychiatric Association, 1987) and has been shown to be useful with community samples (e.g., Lahey et al., 1996; Schwab-Stone et al., 1996; Shaffer et al., 1996). Students were defined as having DSM-III-R anxiety disorders when either generalized anxiety disorder, overanxious
disorder, or social phobia was indicated. These diagnoses were the only ones administered to all participants, with the exception of obsessive–compulsive disorder. The latter was not included as part of the anxiety-disorder criteria given the resulting high rates, which will be addressed in a future study. Functional impairment was necessary for a positive diagnosis. Although some question exists on the reliability of the DISC’s anxiety diagnoses (e.g., Schwab-Stone et al., 1996; Shaffer et al., 1996), the present study attempted to address this issue simultaneously. In particular, if significant results were obtained whereby the STAI predicts DISC anxiety disorders, then this finding would support the reliability of both measures because statistically significant results cannot be obtained with an unreliable predictor or outcome variable. If nonsignificant results were found, then less conclusive statements could be made given that the findings could be due to: (a) unreliable STAI, (2) unreliable DISC, and/or (3) no significant association between a reliable STAI and reliable DISC.

2.2.4. At-risk indicators

Given the low occurrence of disorders in the community as compared to clinical samples, and the need for including students with adjustment difficulties, adolescents who were deemed to be “at risk” for adjustment problems were also selected to be administered the DISC. Two instruments were used to measure this “at-risk” status. (1) The Center for Epidemiologic Studies—Depression (CES-D) Scale (Radloff, 1977) is a device used to indicate depressive symptomatology. This instrument consists of 20 items, each rated on a four-point scale with a total score ranging from 0 to 60. Higher levels indicate greater levels of depressive symptoms. (2) Three items from the Major Life Events Scale (Andrews, Lewinsohn, Hops, & Roberts, 1993) assess suicide attempt. Students are asked to indicate whether a family member, close friend, and/or they themselves “tried to commit suicide” within the past 6 months.

2.3. Procedures

The Committee on Human Studies (Institutional Review Board) of the University of Hawaii at Mānoa approved the procedures for the present study.

2.3.1. Hawaiian High Schools Health Survey

A few weeks prior to the Hawaiian High Schools Health Survey administration, written notification describing the nature and purpose of the study was sent to parents/guardians and students of participating schools. Students did not participate in the study when their parent(s) declined participation (as indicated by parents returning a self-addressed postcard), when the students did not give their own written consent, when the students were not present on the survey date, and when there were logistical difficulties on the administration date. Approximately 60% of the adolescents participated. A separate analysis was conducted using the 1992–1993 data set revealing that more males did not participate, and
those who did not participate had higher rates of absences, suspensions, and conduct infractions in comparison to the adolescents who participated (NHMHRDP, 1999).

2.3.2. Diagnostic Interview Schedule for Children

From the pool of participants who were administered the Hawaiian High Schools Health Survey, students were randomly selected to take part in the DISC administration. Exceptions to this were the 29 “at-risk” students who were selected based on their responses on the CES-D and Major Life Events instruments (see below). Potential participants were presented a consent form to be signed prior to the DISC administration. DISC interviews for consenting students were usually completed within 2 hours at the school site; slightly longer interviews were required for adolescents where positive diagnoses were indicated.

2.3.3. Concurrent versus nonconcurrent STAI–DISC administration

The mean duration between administration of the STAI and DISC was approximately 0.47 years with a range of 0 (STAI and DISC administered on the same day) to 1.36 years. To test for differential results based on the duration between the STAI and DISC, the data were coded on whether the administration of the two instruments were on the same day (i.e., “concurrently”) or the STAI was given at least 1 day prior to the DISC (i.e., “nonconcurrently”). However, it should be noted that the Trait items were not administered concurrently with the DISC.

2.4. Weights

Weights were used because of the under- and overrepresentation of ethnic groups and the bias of the 29 at-risk students. The DISC data set consisted of 58.1% full-/part-Hawaiians, 3.1% Caucasians, 6.4% Filipinos, 10.5% Japanese, and 21.9% mixed/non-Hawaiians or “other.” The Hawaii adolescent population, on the other hand, is composed of 29.6% full-/part-Hawaiians, 13.1% Caucasians, 13.4% Filipinos, 14.9% Japanese, and 29.1% mixed/non-Hawaiians or “other” (based on mean percentages for 14–17-year-olds for 1991 and 1996; Hawaii Health Surveillance, Department of Health, State of Hawaii; personal communication, 1998).

The 29 at-risk students were selected due to their responses on the CES-D and suicide-attempt items on the Major Life Events Scale. A participant was defined as being at risk if he or she obtained a score equal to or greater than 35 on the CES-D and either a family member, close friend, and/or the student himself/herself attempted suicide within the past 6 months. Data compiled from the 1992–1993 school year served as the norm, with 7.4% having a CES-D score equal to or greater than 35, and 16.7% reporting a suicide attempt by either a family member, close friend, and/or self. For the DISC sample, 11.6% had a CES-D total score of 35 or higher, and 18.1% of the students reported a suicide
attempt by either a family member, close friend, and/or self. Weights were calculated by dividing the population percentage by the sample percentage.

2.5. Statistical analyses

Using weights for all analyses, the overall prevalence rate for DISC anxiety disorders was first computed. To determine the associations between the 12 STAI composites and DISC anxiety disorders, univariate and multiple logistic regression analyses were performed. These analyses were conducted separately for concurrent and nonconcurrent administrations of the STAI and DISC. The influence of the five demographic variables (i.e., ethnicity, gender, grade level, main wage earners’ education, main wage earners’ employment) were subsequently investigated by systematically adding these variables to the model. Based on the results of these analyses, predictive-validity values were calculated to estimate the utility of the STAI in predicting DISC anxiety diagnoses.

3. Results

The overall weighted prevalence rate for at least one DISC anxiety disorder (i.e., generalized, overanxious, or social phobia) was 9.19%, or approximately 1 in 10 participants.

3.1. STAI–DISC concurrent administration

Table 2 presents the findings on the various STAI composites predicting DISC anxiety using univariate and multiple logistic regression analyses for both STAI–DISC concurrent and nonconcurrent administrations. As indicated by the univariate analyses for the concurrent administration, all six State composites were statistically significant predictors of DISC anxiety disorders, with State Factor 2 being a better predictor as evidenced by the variance accounted for between State Factor 2 ($R^2 = .178$ for Form X; $R^2 = .186$ for Partial Form Y) and State Factor 1 ($R^2 = .109$ for Form X; $R^2 = .105$ for Partial Form Y). However, the mean of State Factors 1 and 2 was the best single predictor of concurrent DISC anxiety disorders, accounting for 23.0% of the variance using Form X and accounting for 22.2% of the variance using Partial Form Y.

When simultaneously examining both State Factors 1 and 2 in the same model (i.e., multiple logistic regression; see Table 2), State Factor 2 remained a significant predictor of DISC anxiety, but State Factor 1 was no longer a significant predictor of DISC anxiety. In addition, the overall model (which included both State Factors 1 and 2 as main effects) did not predict significantly more variance in DISC anxiety as compared to the mean of State Factors 1 and 2 (i.e., Form X, $\Delta R^2 = .260 - .230 = .030$, $\Delta \chi^2 = 11.81 - 10.45 = 1.36$, $\Delta df = 2 - 1 = 1$,
Table 2
STAI composites predicting DISC anxiety using logistic regression analyses

<table>
<thead>
<tr>
<th>Concurrent vs. Nonconcurrent</th>
<th>Subscale</th>
<th>STAI Form X</th>
<th>STAI Partial Form Y</th>
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<tbody>
<tr>
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<td>Odds ratio</td>
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<td></td>
<td></td>
<td>$R^2_b$</td>
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</tbody>
</table>

**Concurrent State**
- **Univariate**
  - Factor 1: $4.97^*$, 64, 5.16, 1.09–24.43, .109, 4.80*, 64, 4.93, 1.07–22.75, .105
  - Factor 2: $8.08^{**}$, 64, 23.55, 2.25–246.38, .178, 8.49**, 64, 14.39, 2.17–95.27, .186
  - Mean: $10.45^{**}$, 64, 51.73, 3.08–870.11, .230, 10.09**, 64, 31.48, 2.69–368.46, .222
- **Multiple**
  - Factor 1: 3.21, 4.35, 0.87–21.76, .071, 2.13, 3.39, 0.66–17.48, .047
  - Factor 2: 6.02*, 23.66, 1.89–296.28, .132, 5.69*, 10.90, 1.53–77.60, .125
- **Model**
  - Factor 1: 11.81**, 64, .260, 10.83**, 64, .238
  - Factor 2: 8.49**, 64, 23.66, 1.89–296.38, .178, 8.49**, 64, 14.39, 2.17–95.27, .186
  - Mean: 10.45**, 64, 51.73, 3.08–870.11, .230, 10.09**, 64, 31.48, 2.69–368.46, .222

**Nonconcurrent State**
- **Univariate**
  - Factor 2: 12.92****, 409, 2.55, 1.57–4.15, .053, 17.97****, 409, 2.56, 1.69–3.88, .074
  - Mean: 24.03****, 409, 4.26, 2.38–7.62, .098, 27.46****, 409, 4.01, 2.37–6.78, .112
- **Multiple**
  - Factor 2: 3.46, 1.68, 0.97–2.90, .014, 4.23*, 1.68, 1.03–2.75, .017
- **Model**
  - Factor 1: 24.81****, 409, .102, 28.15****, 409, .115
  - Factor 2: 16.28****, 133, 3.52, 1.09–11.42, .067, 16.28****, 133, 3.52, 1.09–11.42, .067
  - Mean: 14.18***, 133, 11.79, 2.81–49.49, .190, 15.26****, 133, 11.78, 2.92–47.49, .205

**Trait**
- **Univariate**
  - Factor 1: 5.03*, 133, 3.52, 1.09–11.42, .067, 5.03*, 133, 3.52, 1.09–11.42, .067
  - Factor 2: 16.28****, 133, 8.30, 2.63–26.17, .219, 17.71****, 133, 7.79, 2.65–22.87, .236
  - Mean: 14.18****, 133, 11.79, 2.81–49.49, .190, 15.26****, 133, 11.78, 2.92–47.49, .205
- **Multiple**
  - Factor 1: 0.56, 1.53, 0.50–4.69, .007, 0.42, 1.45, 0.47–4.48, .006
  - Factor 2: 10.68**, 7.42, 2.23–24.68, .144, 11.67***, 7.10, 2.31–21.86, .157
- **Model**
  - Factor 1: 16.85****, 133, .226, 18.14****, 133, .244

No data for concurrent Trait.

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^a CI=confidence interval.

^b $R^2=(\chi^2)/(–2)$(log likelihood).

* $P<.05$.

** $P<.01$.

*** $P<.001$.

**** $P<.0001$. 
To determine the association with the five demographic variables (i.e., ethnicity, gender, grade level, main wage earners’ education, main wage earners’ employment), 10 analyses of variance (ANOVA)s were performed. The first five analyses involved the State mean entered into the model first, followed by each of the demographic variables entered separately. The second set of five analyses entailed examining the five interaction effects between the State mean and each of the five demographic variables. For these latter five ANOVA,s the State mean and demographic variable were entered into the model first, followed by the respective interaction effect (e.g., model=State mean, ethnicity, and State mean-xEthnicity). Given that 10 different ANOVA,s were conducted, alpha was set more conservatively at .01. No statistically significant demographic main effects and interaction effects were obtained.

3.2. STAI–DISC nonconcurrent administration

When the State items were not administered concurrently with the DISC, the State mean remained the best single predictor of DISC anxiety (see Table 2). However, the variances accounted for were greatly diminished (i.e., Form X=9.8%, Partial Form Y=11.2%), and there was no clear indication on whether State Factor 1 versus State Factor 2 was the better predictor. When simultaneously examining both State Factors 1 and 2 in the same model, the overall model did not predict significantly more variance in DISC anxiety as compared to the State mean (i.e., Form X, ΔR²=.102-.098=.004, Δχ²=24.81-24.03=0.78, Δdf=2−1=1, P>.05; Partial Form Y, ΔR²=.115-.112=.003, Δχ²=28.15−27.46=0.69, Δdf=2−1=1, P>.05), and there was a slight advantage of State Factor 1 being a better predictor than State Factor 2 of DISC anxiety.

To further explore the impact of the STAI–DISC duration on the prediction of anxiety disorders, the nonconcurrent data were divided into two distinct samples: (1) those who were administered the STAI State subscale within 3 months prior to the DISC, and (2) those who were administered the STAI State subscale 9 months to 1.36 years prior to the DISC. Given the decreased n sizes of these two respective groups, more sophisticated analyses were not conducted (e.g., demographic variables, interaction effects). However, to rule out the possibility that the second group (9-month to 1.36-year STAI–DISC difference) did not allow for any predictive validity, separate analyses were conducted for these two groups on the basic predictions. Although the first group (≤3-month STAI–DISC difference; n=250) had higher levels of prediction as would be expected (i.e., State Factor 1, χ²=16.6, R²=.121, P<.0001; State Factor 2, χ²=11.6, R²=.084, P<.001; State mean, χ²=18.3, R²=.133, P<.0001), significant amounts of variance were also predicted for the second group (n=159) with State Factor 1 (χ²=6.3, R²=.057, P<.05) and the State mean (χ²=7.7, R²=.070, P<.01) and approached significance for State Factor 2 (χ²=3.4, R²=.031, P<.07).
Similar analyses of the demographic variables as that performed using the concurrent State mean were conducted using the nonconcurrent State mean, with alpha set at .01 as before. Only the main wage earners’ employment status as a main effect accounted for a statistically significant amount of variance: with the State Form X mean entered first, $\chi^2(1) = 7.77$, odds ratio $= 0.62$, odds ratio 95% confidence interval $= 0.44–0.87$, $R^2 = .032$, $P = .0053$; with the State Partial Form Y mean entered first, $\chi^2(1) = 7.51$, odds ratio $= 0.62$, odds ratio 95% confidence interval $= 0.44–0.87$, $R^2 = .031$, $P = .0061$. It should be noted, however, that even with inclusion of the earners’ employment in the model in addition to the State mean, only 12.8% (State Form X) and 14.1% (State Partial Form Y) of the variance in DISC anxiety were accounted for.

For the nonconcurrent Trait items, the trends indicated that Factor 2 was the best single predictor of DISC anxiety accounting for 21.9% (Trait Form X) and 23.8% (Trait Partial Form Y) of the variance. Unlike the State composites, Trait Factor 2 was a better predictor than even the Trait mean. The simultaneous model that included both Trait Factors 1 and 2 clearly demonstrated that Trait Factor 2 accounted for more unique variance in DISC anxiety than did Trait Factor 1. In addition, the simultaneous two-variable (i.e., Trait Factors 1 and 2) model did not significantly increase the variance accounted for in comparison to the univariate Trait Factor 2 (i.e., Form X, $\Delta R^2 = .226–.219 = .007$, $\Delta \chi^2 = 16.85–16.28 = 0.57$, $\Delta df = 2–1 = 1$, $P > .05$; Partial Form Y, $\Delta R^2 = .244–.238 = .006$, $\Delta \chi^2 = 18.14–17.71 = 0.43$, $\Delta df = 2–1 = 1$, $P > .05$). Examination of the 10 ANOVAs involving the demographic variables did not reveal any statistically significant effects ($\alpha = .01$).

3.3. Predictive validity

Given the relatively consistent pattern of the concurrent State mean being the best single predictor of DISC anxiety accounting for 21.9% (Trait Form X) and 23.8% (Trait Partial Form Y) of the variance. Unlike the State composites, Trait Factor 2 was a better predictor than even the Trait mean. The simultaneous model that included both Trait Factors 1 and 2 clearly demonstrated that Trait Factor 2 accounted for more unique variance in DISC anxiety than did Trait Factor 1. In addition, the simultaneous two-variable (i.e., Trait Factors 1 and 2) model did not significantly increase the variance accounted for in comparison to the univariate Trait Factor 2 (i.e., Form X, $\Delta R^2 = .226–.219 = .007$, $\Delta \chi^2 = 16.85–16.28 = 0.57$, $\Delta df = 2–1 = 1$, $P > .05$; Partial Form Y, $\Delta R^2 = .244–.238 = .006$, $\Delta \chi^2 = 18.14–17.71 = 0.43$, $\Delta df = 2–1 = 1$, $P > .05$). Examination of the 10 ANOVAs involving the demographic variables did not reveal any statistically significant effects ($\alpha = .01$).
<table>
<thead>
<tr>
<th>Mean STAI cutpoint</th>
<th>State, mean (concurrent)</th>
<th>Trait, Factor 2 (nonconcurrent)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Positive predictive value</td>
<td>Negative predictive value</td>
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<tr>
<td></td>
<td>%</td>
<td>Ratio</td>
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<tr>
<td>0.00</td>
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<td>10.5</td>
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<td>100.0</td>
<td>24.6</td>
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<td>0.75</td>
<td>100.0</td>
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<td>1.00</td>
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<tr>
<td>1.25</td>
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<td>37.5</td>
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<tr>
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</table>
Of these 13, 5 (or 38.5% = positive predictive value) would be diagnosed with an anxiety disorder using the DISC. These five adolescents would constitute 62.5% (sensitivity) of the total of eight who would have been diagnosed on the DISC with an anxiety disorder from the entire sample of 65 adolescents. The cutoff of 1.00 indicated that negatively worded items were rated “somewhat,” “moderately so,” or “very much so”; positively worded items were rated “moderately so,” “somewhat,” or “not at all.”

Comparable prediction rates were obtained with the Trait Factor 2 measure (see Table 3). With cutoffs from 1.25 to 2.25, sensitivity values ranged from 60.0% to 90.0%, and specificity rates ranged from 61.5% to 93.4%. However, predictive-validity values ranged from 16.1% to 42.9%. Using the cutoff of 2.00, of the 132 students screened with the STAI, 23 (or 17%) would be referred for a more comprehensive evaluation. Of the 23, 8 (or 34.8% = positive predictive value) would be diagnosed with an anxiety disorder on the DISC. These 8 positive cases would constitute 80% (sensitivity) of the total of 10 adolescents who would have been diagnosed with an anxiety disorder. Translated into rating-scale terminology, the cutoff of 2.00 or 2.25 reflected ratings of “often” and “almost always” for negatively worded items, and “sometimes” and “almost never” for positively worded items.

To determine whether the three DISC anxiety disorders were being differentially predicted by Trait Factor 2, the students identified through the use of the Trait Factor 2 cutoff of 2.00 were further examined. Of the eight who had at least one DISC anxiety disorder, five were diagnosed with generalized anxiety disorder, five were diagnosed with overanxious disorder, and six were diagnosed with social phobia. Therefore, no substantial difference was suggested in the Trait Factor 2 differentially predicting one type of DISC anxiety disorder over another.

4. Discussion

The overall anxiety prevalence rate of 9.19% found for the present Asian/Pacific Islander adolescents was within the range found in other epidemiological studies. This figure indicated that approximately 1 in 10 high school students had at least generalized anxiety disorder, overanxious disorder, or social phobia that impaired their functioning. Similar to other studies, this rate is very high relative to the 1% figure of children who are identified as being “emotionally disturbed” by the IDEA from kindergarten to high school. Clearly, greater efforts are needed to determine why such a discrepancy exists (e.g., lack of teacher and parent referrals) across diverse cultures.

As a first step in identifying students who may have anxiety-related adjustment difficulties, the STAI was used to predict concurrent and later DISC performance. All 12 STAI composites were statistically significant predictors of DISC anxiety disorders, as expected from the first hypothesis. This supported
the overall concurrent validity and predictive validity of the STAI in the prediction of DISC anxiety.

When the STAI and DISC were concurrently administered on the same day, State Factor 2 was a slightly better predictor of DISC anxiety than State Factor 1. Similarly, when the STAI and DISC were nonconcurrently administered, Trait Factor 2 was clearly the better predictor of DISC anxiety than Trait Factor 1. Both of these findings were consistent with the hypothesis that STAI Factor 2 (anxiety-present) items that were negatively worded were more sensitive to the measure of high levels of anxiety than the positively worded items. However, for the concurrent State composites, the overall State mean was found to be the best predictor of DISC anxiety, indicating that both State Factors 1 and 2 contributed to the predictive validity of the State measure.

The second hypothesis, that the State (as compared to Trait) composites would better predict concurrent DISC anxiety, and the Trait (as compared to State) measures would better predict nonconcurrent DISC anxiety, was generally supported. These findings were consistent with the theoretically meaningful demarcation made between State and Trait anxiety. However, no participants were administered the Trait items concurrently with the DISC anxiety module, and therefore, this hypothesis could not be fully tested. It is conceivable that the Trait composites may have been the best predictors for both concurrent and nonconcurrent DISC anxiety disorders, given that two of the three anxiety disorders were less specified (i.e., generalized, overanxious).

Finally, adding the demographic variables as main effects, including ethnicity (i.e., Hawaiian vs. non-Hawaiian), did not significantly improve the prediction model. The lack of significant interaction effects between the best STAI predictor and each of the demographic variables demonstrated that the association between the STAI measure and DISC anxiety was not substantially different as a function of ethnicity, gender, grade level, and SES. Therefore, the third hypothesis of negligible effects of demographic variables was supported.

In examining the predictive validity of the overall mean of State Partial Form Y, the cutpoint of 1.00 would result in 20% of the sample being referred for further comprehensive testing, and 62.5% of students with an anxiety disorder being identified. This would mean that a total of only 13 items (i.e., 8 for State Factor 1, 5 for State Factor 2) would be required to screen for anxiety disorders using concurrent administration of the STAI State Partial Form Y.

The predictive validity of Factor 2 (anxiety-present) for Trait Partial Form Y indicated similar predictive values. The cutpoint of 2.00 would result in 17% of the sample being referred for further evaluation, and 80.0% of the adolescents with an anxiety disorder being identified. However, Factor 2 of the Trait Partial Form Y utilizes about half the number of items as the State Partial Form Y. Only seven negatively worded items represent Factor 2 of the Trait Partial Form Y. Inspection of the individual statements reveals their face validity: could be as happy as others, difficulties are piling up so that they cannot be overcome, worry too much, lack self-confidence, unimportant thought runs
through mind and bothers me, take disappointments so keenly, and become tense/upset.

In general, the present study demonstrated the utility of the STAI State mean and Trait Factor 2 (anxiety-present) in predicting concurrent and future DSM-III-R anxiety disorders. This is important from several vantage points. First, the standardized anxiety-symptom measure of the STAI and the lay-administered computerized DISC were found to be reliable and valid indicators of difficulties associated with anxiety. Second, the validity of these measures were established for a very diverse group of minority adolescents (i.e., full-/part-Hawaiians, Filipinos (females), Japanese, Caucasians, and mixed/non-Hawaiians) residing in Hawaii. Third, anxiety disorders are one of the most underdiagnosed disabilities of children and adolescents. The findings of the present study offer a means of screening and identifying relatively large numbers of underserved high school students. Fourth, screening and identification can be successfully completed in a cost-efficient manner with only selected items of the STAI, which can be administered via paper-and-pencil and in groups of any size. The average time to complete the selected STAI items would be less than 5 minutes. Student responses could be easily hand-scored or computer-scored with the appropriate optical response sheets. Fifth, resources not expended on large-scale, inefficient identification and diagnostic methods (e.g., DISC anxiety module which requires the necessary software and computer, training of the DISC interviewer, one-to-one/face-to-face interaction; or comprehensive evaluation by a qualified clinician) could be reallocated to the completion of thorough assessments of those screened to be “at risk” and to the provision of appropriate and effective interventions. Sixth, implementation of such a successful screening and intervention-based program should greatly benefit adolescents with anxiety symptoms and disorders, and should substantially decrease the potential for future escalation of adjustment difficulties due to anxiety.

Acknowledgments

This article was supported by the Research Centers in Minority Institutes (RCMI) Supplement, National Institutes of Health (NIH), Grant No. RR0361-06S1; National Institute of Mental Health (NIMH), Grant No. 1 R24 MH5015-01; NIMH Grant No. 1 R24 MH57079-01A1, the Queen Emma Foundation, and the Native Hawaiian Center of Excellence. The authors would like to thank the researchers and administrators of the Native Hawaiian Mental Health Research Development Program.

References


