

Barriers to Seeking Counseling Among STEM Students: The Revised Fit, Stigma, and Value Scale



*The Professional Counselor*TM
Volume 12, Issue 3, Pages 249–261
<http://tpcjournal.nbcc.org>
© 2022 NBCC, Inc. and Affiliates
doi: 10.15241/mtk.12.3.249

Michael T. Kalkbrenner, Gabriella Miceli

Meeting the mental health needs of students enrolled in science, technology, engineering, and mathematics (STEM) majors is particularly challenging for professional counselors who work in college settings, as STEM students are a subgroup of college students that face unique risks for developing mental health issues. The scarcity of literature on STEM student mental health coupled with their reticence to seek counseling is concerning. An important next step in this line of research is understanding why STEM students are reticent to seek counseling. Accordingly, the present investigators validated STEM students' scores on the Revised Fit, Stigma, and Value (RFSV) Scale, a screening tool for measuring barriers to seeking counseling. Results also established the capacity of STEM students' RFSV scores to predict peer-to-peer referrals to the counseling center and revealed demographic differences in barriers to counseling. Findings have implications for enhancing professional counselors' efforts to support STEM students' mental health.

Keywords: Revised Fit, Stigma, and Value Scale; STEM; student mental health; barriers to counseling; peer-to-peer referrals

The frequency and complexity of college students presenting with mental health issues is a notable concern for professional counselors who work in university settings (Al-Maraira & Shennaq, 2021; Hong et al., 2022). Students enrolled in science, technology, engineering, and mathematics (STEM) majors are a distinctive group of college students who face unique risks for developing mental health issues (Daker et al., 2021; Kalkbrenner, James, & Pérez-Rojas, 2022; Lipson et al., 2016; Shapiro & Sax, 2011). When compared to their non-STEM counterparts, STEM students are less likely to recognize warning signs of mental distress, and they access mental health support services at lower rates than their peers. In addition, the harsh and competitive academic environment in STEM majors can exacerbate students' risk for mental health distress (Lipson et al., 2016; Shapiro & Sax, 2011). Moreover, Rice et al. (2015) demonstrated that STEM students exhibit higher levels of maladaptive perfectionism, which is associated with higher levels of mental distress.

Whereas substantial academic and financial resources exist to support STEM students (U.S. Department of Education, 2020), there is a dearth of literature on supporting STEM students' mental health, which is essential for retaining students and ensuring their success both in and out of the classroom (Kivlighan et al., 2021; Schwitzer et al., 2018). This gap in the literature is concerning, as STEM students are at risk for mental health issues, which can lead to attrition, isolation, and suicide (Daker et al., 2021; Kalkbrenner, James, & Pérez-Rojas, 2022; Lipson et al., 2016). As just one example, academic mental health distress is a significant predictor of lower enrollment and completion rates in STEM fields (Daker et al., 2021). Moreover, Muenks et al. (2020) found that higher levels of psychological vulnerability among STEM students was a significant predictor of lower class attendance, higher dropout intentions, and less class engagement.

Michael T. Kalkbrenner, PhD, NCC, is an associate professor at New Mexico State University. Gabriella Miceli, MS, LPC-A, is a doctoral student at New Mexico State University. Correspondence may be addressed to Michael T. Kalkbrenner, 1780 E. University Ave., Las Cruces, NM 88003, mkalk001@nmsu.edu.

The literature is lacking research on why STEM students tend to seek counseling at lower rates than non-STEM students. One of the first steps in supporting STEM students' mental health is validating scores on a screening tool for identifying barriers to accessing mental health support services among STEM students. Although screening tools that appraise barriers to counseling exist, none of them have been validated with STEM students. The Revised Fit, Stigma, and Value (RFSV) Scale is a screening tool for appraising barriers to counseling that has been normed with non-college-based populations (e.g., adults in the United States; Kalkbrenner & Neukrug, 2018) and college students with mental health backgrounds (e.g., graduate counseling students; Kalkbrenner & Neukrug, 2019), as just a few examples. When compared to the existing normative RFSV Scale samples, STEM students are a distinct college student population who utilize counseling services at lower rates than students in mental health majors (e.g., psychology; Kalkbrenner, James, & Pérez-Rojas, 2022). The psychometric properties of instrumentation can fluctuate significantly between different populations, and researchers and practitioners have an ethical obligation to validate scores on instruments before interpreting the results with untested populations (Mvududu & Sink, 2013). Accordingly, the primary aims of the present study were to validate STEM students' scores on the RFSV Scale (Kalkbrenner & Neukrug, 2019), test the capacity of RFSV scores for predicting referrals to the counseling center, and investigate demographic differences in STEM students' RFSV scores.

The Revised Fit, Stigma, and Value (RFSV) Scale

Neukrug et al. (2017) developed and validated scores on the original version of the Fit, Stigma, and Value (FSV) Scale for appraising barriers to counseling among a large sample of human services professionals. The FSV Scale contains the three following subscales or latent traits behind why one would be reluctant to seek personal counseling: Fit, Stigma, and Value. Kalkbrenner et al. (2019) validated scores on a more concise version of the FSV Scale, which became known as the RFSV Scale, which includes the same three subscales as the original version. Building on this line of research, Kalkbrenner and Neukrug (2019) found a higher-order factor, the Global Barriers to Counseling scale. The Global Barriers to Counseling scale is composed of a total composite score across the three single-order subscales (Fit, Stigma, and Value). Accordingly, the Fit, Stigma, and Value subscales can be scored separately and/or users can compute a total score for the higher-order Global Barriers to Counseling scale.

Scores on the RFSV Scale have been validated with a number of non-college populations, including adults in the United States (Kalkbrenner & Neukrug, 2018), professional counselors (Kalkbrenner et al., 2019), counselors-in-training (Kalkbrenner & Neukrug, 2019), and high school students (Kalkbrenner, Goodman-Scott, & Neukrug, 2020). If scores are validated with STEM students, the RFSV Scale could be used to enhance professional counselors' mental health screening efforts to understand and promote STEM student mental health. Specifically, campus-wide mental health screening has implications for promoting peer-to-peer mental health support. For example, college counselors are implementing peer-to-peer mental health support initiatives by training students to recognize warning signs of mental distress in their peers and, in some instances, refer them to college counseling services (Kalkbrenner, Sink, & Smith, 2020).

Peer-to-Peer Mental Health Support

College students tend to discuss mental health concerns with their peers more often than with a faculty member or student affairs professional (Wawrzynski et al., 2011; Woodhead et al., 2021). To this end, the popularity and utility of peer-to-peer mental health support initiatives has grown in recent years (Kalkbrenner, Lopez, & Gibbs, 2020; Olson et al., 2016). The effectiveness of these peer-to-peer support initiatives can be evaluated by test scores (e.g., scores on mental distress and well-being inventories) as well as non-test criteria (e.g., increases in the frequency of peer-to-peer mental health

referrals). For example, Olson et al. (2016) found that college students who attended a Recognize & Refer workshop were significantly more likely to refer a peer to counseling when compared to students who did not attend the workshop. Similarly, Kalkbrenner, Lopez, and Gibbs (2020) found that increases in college students' awareness of warning signs for mental distress were predictive of substantial increases in the odds of making peer-to-peer referrals to the counseling center.

Peer-to-peer mental health support also has implications for improving college student mental health (Bryan & Arkowitz, 2015; Byrom, 2018; Caporale-Berkowitz, 2022). For example, Bryan and Arkowitz (2015) found that peer-run support programs for depression were associated with significant reductions in depressive symptoms. In addition, Byrom (2018) demonstrated that peer support interventions were associated with increases in college students' well-being. The synthesized results of the studies cited in this section suggest that peer-to-peer mental health support has utility for promoting mental health among general samples of undergraduate college students. However, to the best of our knowledge, the literature is lacking research on peer-to-peer mental health support with STEM majors, a subgroup of college students with unique mental health needs (Daker et al., 2021; Lipson et al., 2016; Shapiro & Sax, 2011).

The Present Study

College counseling services are a valuable resource for students, as attendance in counseling is associated with increases in GPA and retention rates (Kivlighan et al., 2021; Lockard et al., 2019; Schwitzer et al., 2018). Considering STEM students' unique vulnerability to mental health distress (Daker et al., 2021; Lipson et al., 2016; Shapiro & Sax, 2011) and their reticence to seek counseling (Kalkbrenner, James, & Pérez-Rojas, 2022), professional counselors who work in university settings need screening tools with validated scores for identifying why STEM students might avoid accessing counseling services. The RFSV Scale has potential to fill this gap in the measurement literature, as a number of recent psychometric studies (e.g., Kalkbrenner, Goodman-Scott, & Neukrug, 2020; Kalkbrenner & Neukrug, 2018) demonstrated support for the psychometric properties of scores on the RFSV Scale with non-college populations. However, the literature is lacking a screening tool for appraising barriers to counseling with validated scores among STEM students. Accordingly, a score validation study with STEM students is an important next step in this line of research, as the internal structure of instrumentation can vary notably between different samples (Mvududu & Sink, 2013). The literature is also lacking research on the potential of peer-to-peer mental support (e.g., students recognizing and referring a peer to counseling) among STEM students. This is another notable gap in the literature, as college students are more likely to discuss mental health concerns with a peer than with faculty or other university personnel (Wawrzynski et al., 2011; Woodhead et al., 2021). If STEM students' scores on the RFSV Scale are validated, we will proceed to test the capacity of scores for predicting peer-to-peer referrals to the counseling center as well as examine demographic differences in STEM students' RFSV scores.

The findings of the present investigation have implications for campus-wide mental health screening, increasing peer-to-peer mental health support, and identifying subgroups of STEM students that might be particularly reticent to seek counseling. To this end, the following research questions (RQs) and hypotheses (H_a) guided the present investigation: RQ1: Is the internal structure of scores on the RFSV Scale confirmed with STEM students? H_a 1: The dimensionality of the RFSV Scale will be confirmed with STEM students. RQ2: Are STEM students' RFSV scores significant predictors of making at least one referral to the counseling center? H_a 2: Higher RFSV scores will emerge as a statistically significant positive predictor of STEM students making one or more peer referrals to the counseling center. RQ3: Are there significant demographic differences in FSV barriers to counseling among STEM students? H_a 3: Statistically significant demographic differences in STEM students' RFSV scores will emerge.

Methods

Participants and Procedures

Following IRB approval, first author Michael T. Kalkbrenner obtained an email list from the Office of University Student Records of all students who were enrolled in a STEM major at a research-intensive university with four campus locations in three cities located in the Southwestern United States. A recruitment message was sent out to the email list via Qualtrics Secure Online Survey Platform. A total of 407 prospective participants clicked on the survey link. A response rate could not be calculated, as Qualtrics does not track inaccurate or inactive email addresses. A review of the raw data revealed 41 cases with 100% missing data. Likely, these 41 prospective participants clicked on the link to the survey and decided not to participate. Following the removal of those 41 cases, less than 20% of data were missing for the remaining 366 cases. Little's Missing Completely at Random test indicated that the data could be treated as missing completely at random ($p = .118$) and expectation maximization was used to impute missing values. An investigation of standardized z-scores revealed six univariate outliers ($z > \pm 3.29$) and Mahalanobis distances displayed eight multivariate outliers, which were removed from the data set, yielding a robust sample of $N = 352$.

Participants ranged in age from 18 to 63 ($M = 24.29$; $SD = 8.59$). The demographic profile for gender identity consisted of 65.1% ($n = 229$) female, 30.4% ($n = 107$) male, 2.0% ($n = 7$) non-binary, 1.1% ($n = 4$) transgender, 0.6% ($n = 2$) an identity not listed ("please specify"), and 0.9% ($n = 3$) prefer not to answer. The ethnracial demographic profile consisted of 2.6% ($n = 9$) Native Indian or Alaska Native; 3.1% ($n = 11$) Asian or Asian American; 2.0% ($n = 7$) Black or African American; 48.3% ($n = 170$) Hispanic, Latinx, or Spanish origin; 2.0% ($n = 7$) Middle Eastern or North African; 3.4% ($n = 12$) Multiethnic; 36.6% ($n = 129$) White or European American; 1.1% ($n = 4$) Another race, ethnicity, or origin ("please specify"); and 0.9% ($n = 3$) preferred not to answer. The present sample was composed of notably more diverse groups of STEM students when compared to national estimates of STEM students (National Center for Educational Statistics [NCES], 2020). The NCES's estimates revealed fewer women (33.0%, $n = 263,034$) and Latinx (12.3%, $n = 94,927$) STEM students as well as fewer White students (49.8%, $n = 385,132$). But the NCES's national estimates included larger proportions of Black (7.2%, $n = 55,642$) and Asian (11.0%, $n = 85,135$) STEM students when compared to the present sample.

Instrumentation

Participants completed a demographic questionnaire by indicating their informed consent, then confirming they met the following inclusion criteria for participation: (a) 18 years or older, (b) enrolled in at least one undergraduate STEM course, and (c) currently a STEM major. The demographic questionnaire concluded with questions about respondents' age, gender identity, ethnracial identity, help-seeking history, and if they had referred one or more peers to the counseling center.

The Revised FSV Scale

The RFSV Scale is a screening tool that was designed to measure barriers to seeking counseling (Kalkbrenner, Neukrug, & Griffith, 2019). Participants respond to a prompt ("I am less likely to attend counseling because . . .") for 14 declarative statements on the following Likert scale: 1 = *Strongly Disagree*, 2 = *Disagree*, 3 = *Neither Agree nor Disagree*, 4 = *Agree*, or 5 = *Strongly Agree*. The RFSV Scale is composed of three subscales or latent traits behind one's reticence to seek counseling, including Fit, Stigma, and Value. Scores on the Fit subscale can range from 5 to 25, with higher scores indicating more restraint from seeking counseling because one believes the process of counseling is not suitable with their personal worldview (e.g., "I couldn't find a counselor who would understand me"). Scores on the Stigma subscale also range from 5 to 25, and higher scores denote a greater hesitation to seek

counseling due to feelings of embarrassment or shame (e.g., “It would damage my reputation”). Scores on the Value subscale range from 4 to 20, with higher scores indicating a greater disinclination to seek counseling because they believe the effort required would not be worth the potential benefits (e.g., “Counseling is unnecessary because my problems will resolve naturally”).

The Global Barriers to Counseling scale is composed of test takers’ average composite score across the three Fit, Stigma, and Value subscales and produces an overall estimation of a test taker’s sensitivity to barriers toward seeking counseling. Scores on the Global Barriers to Counseling scale range from 13 to 65, with higher scores indicating a greater reticence to seek counseling. The collective findings of past investigators demonstrated evidence for the internal structure validity (confirmatory factor analysis) and internal consistency reliability ($\alpha = .70$ to $\alpha = .91$) of scores on the RFSV Scale with a number of non-college populations (Kalkbrenner, Goodman-Scott, & Neukrug, 2020; Kalkbrenner & Neukrug, 2018, 2019; Kalkbrenner et al., 2019).

Data Analysis

A confirmatory factor analysis (CFA) based on structural equation modeling was computed in IBM SPSS AMOS version 26 to answer the first RQ about the dimensionality of STEM students’ RFSV scores. We used the joint suggestions from Dimitrov (2012) and Schreiber et al. (2006) for acceptable model fit in CFA: chi-square absolute fit index (CMIN; non-significant p -value or χ^2 to $df < 3$), comparative fit index (CFI; .90 to .95 = acceptable fit and $> .95$ = close fit), root mean square error of approximation (RMSEA; $\leq .08$), and the standardized root mean square residual (SRMR; $\leq .08$). Internal consistency reliability evidence of test scores is another important step in testing a scale’s psychometric properties. Cronbach’s coefficient alpha (α) is the most popular internal consistency reliability estimate; however, its proper use is dependent on the data meeting several statistical assumptions (McNeish, 2018). Composite internal consistency reliability estimates, such as McDonald’s coefficient omega (ω), tend to produce more stable reliability estimates of scores. Accordingly, the present investigators computed both α and ω .

College students are more likely to discuss mental health concerns with their peers than with faculty, staff, or other university personnel (Wawrzynski et al., 2011; Woodhead et al., 2021). Accordingly, college counseling researchers and practitioners are devoting more time to peer-to-peer mental health support initiatives with the goal of increasing peer-to-peer referrals to the counseling center (Kalkbrenner, Sink, & Smith, 2020; Olson et al., 2016). Past investigators (e.g., Kalkbrenner, Neukrug, & Esquivel, 2022) found that the RFSV barriers were significant predictors of peer-to-peer referrals to the counseling center with non-STEM students. To test the generalizability of this finding with STEM students, we conducted a logistic regression analysis to answer the second RQ regarding the capacity of STEM students’ RFSV scores to predict at least one peer referral to the counseling center. STEM students’ interval-level composite scores on the Fit, Stigma, and Value subscales were entered into the model as predictor variables. The criterion variable was quantified on a categorical scale. On the demographic questionnaire, students responded to the following question: “Have you ever referred (recommended) another student to counseling services?” and selected either “0 = never referred a peer to the counseling center” or “1 = referred one or more peers to the counseling center.”

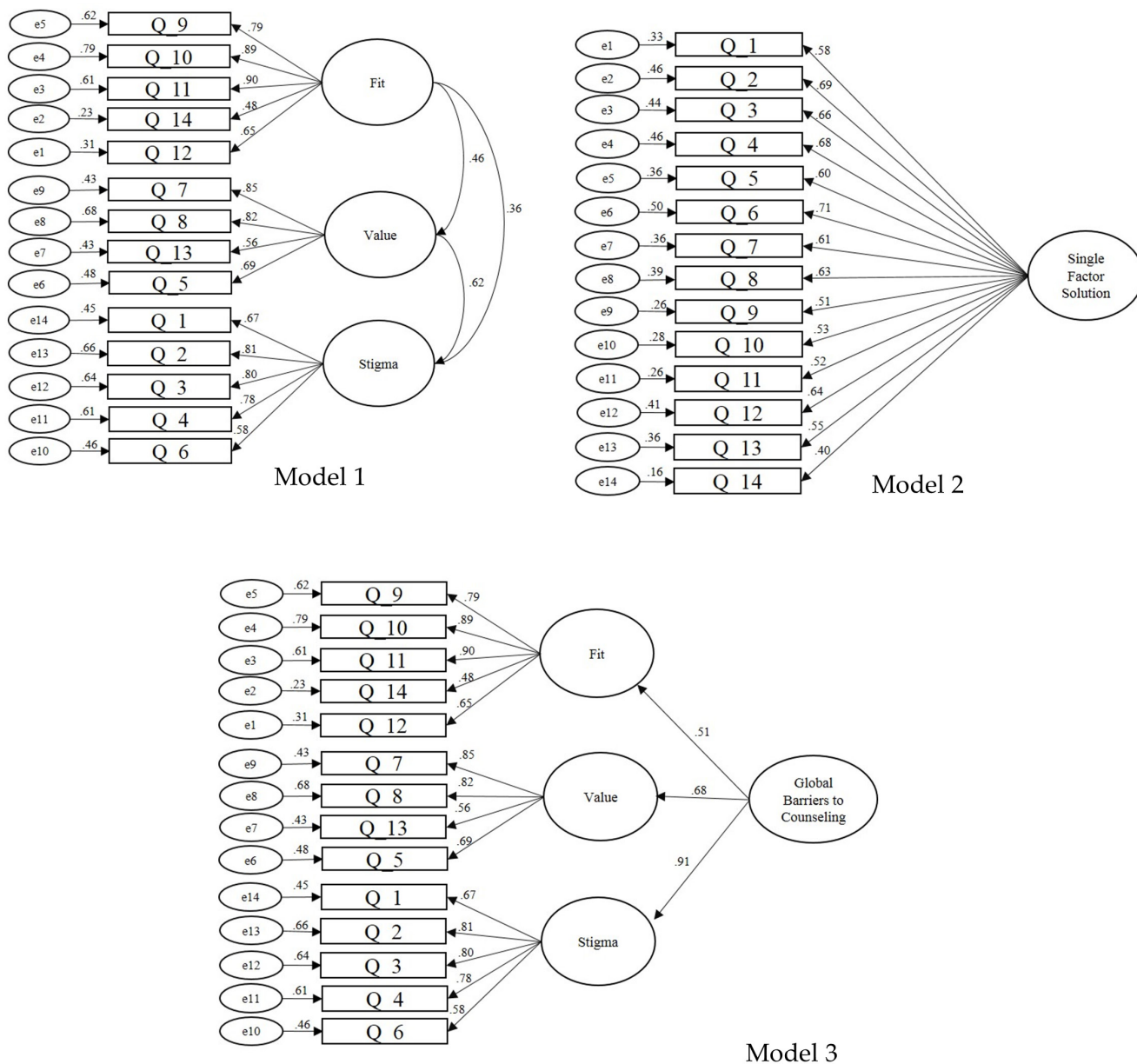
A 2(gender) X 3(race/ethnicity) X 2(help-seeking history) multivariate analysis of variance (MANOVA) was computed to investigate the third RQ regarding demographic differences in RFSV barriers among STEM students. The three categorical-level independent variables included gender (male or female), race/ethnicity (Latinx, White, or other ethnicity), and help-seeking history (never attended counseling or attended at least one counseling session). The three interval-level dependent variables included STEM students’ composite scores on the Fit, Stigma, and Value subscales. Discriminant analysis was employed as a post hoc test for MANOVA (Warne, 2014).

Results

The RFSV Scale items were entered into a CFA to test the dimensionality of scores with STEM students (RQ1). Excluding the CMIN ($\chi^2 [74] = 257.55, p < .001, \chi^2$ to $df = 3.48$), results revealed a satisfactory model fit: CFI = .92; RMSEA = .08, 90% CI [.07, .10]; and SRMR = .08. The CMIN tends to underestimate model fit with samples that are large enough for CFA (Dimitrov, 2012). Thus, adequate internal structure validity evidence of scores was achieved based on the collective CFI, RMSEA, and SRMR results. The standardized factor loadings were all acceptable-to-strong and ranged from .48 to .90 (see Figure 1, Model 1).

Figure 1

Revised FSV Scale Path Models With Standardized Coefficients



Based on the findings of Kalkbrenner and Neukrug (2019), we computed a higher-order confirmatory factor analysis (HCFA) to test for a Global Barriers to Counseling scale. As expected, the single-factor RFSV model (see Figure 1, Model 2) revealed poor model fit: CMIN ($\chi^2 [77] = 1,013.71$, $p < .001$, χ^2 to $df = 13.17$); CFI = .61; RMSEA = .19, 90% CI [.18, .20]; and SRMR = .13. Accordingly, the theoretical support for a higher-order model (Kalkbrenner & Neukrug, 2019) coupled with the poor fitting single-factor model (see Figure 1, Model 2) indicated that computing an HCFA was appropriate. Except for the CMIN ($\chi^2 [74] = 257.55$, $p < .001$, χ^2 to $df = 3.48$), the higher-order model (see Figure 1, Model 3) displayed a satisfactory model fit: CFI = .92; RMSEA = .08, 90% CI [.07, .10]; and SRMR = .08. Tests of internal consistency reliability revealed satisfactory reliability evidence of scores on the Fit ($\alpha = .84$, $\omega = .83$), Stigma ($\alpha = .86$, $\omega = .87$), and Value ($\alpha = .79$, $\omega = .79$) subscales and the Global Barriers to Counseling scale ($\alpha = .88$, $\omega = .88$).

STEM students' RFSV scores were entered into a logistic regression analysis to answer RQ2 regarding the capacity of STEM students' RFSV scores to predict at least one referral to the counseling center. The logistic regression model was statistically significant, $X^2(1) = 80.97$, $p < .001$, Nagelkerke $R^2 = .064$. The odds ratios, $Exp(B)$, revealed that a decrease of one unit in STEM students' scores on the Value subscale (higher scores = less value toward counseling) was associated with a decrease in the odds of having made at least one peer-to-peer referral to the counseling center by a factor of .559.

A factorial MANOVA was computed to answer RQ3 regarding demographic differences in RFSV barriers among STEM students. A significant main effect emerged for gender on the combined dependent variables, $F(3, 316) = 5.23$, $p = .002$, Pillai's Trace = 0.05, $\eta_p^2 = 0.047$. The post hoc discriminant analysis (DA) revealed a significant discriminant function, Wilks $\lambda = 0.93$, $\chi^2 = 23.60$, $df = 3$, canonical correlation = 0.26, $p < .001$. The standardized canonical discriminant function coefficients between the latent factors and discriminant functions showed that the Value factor loaded more strongly on the discriminant function (1.10) than the Stigma (0.17) or Fit (-0.62) factors. The mean discriminant score on the function for male participants was 0.40. The mean discriminant score on the function for female participants was -0.19. In other words, the MANOVA and post hoc DA revealed that male STEM students scored significantly higher (higher scores reflect greater reluctance to seek counseling) on the Value barrier when compared to female STEM students.

A significant main effect also emerged for help-seeking history on the combined dependent variables, $F(3, 467) = 4.65$, $p = .003$, Pillai's Trace = 0.04, $\eta_p^2 = 0.042$. The post hoc DA displayed a significant discriminant function, Wilks $\lambda = 0.93$, $\chi^2 = 24.10$, $df = 3$, canonical correlation = 0.26, $p < .001$. The standardized canonical discriminant function coefficients between the latent factors and discriminant functions showed that the Value factor loaded more strongly on the discriminant function (1.10) than the Stigma (0.01) or Fit (-0.71) factors. The mean discriminant score on the function for participants without a help-seeking history was 0.25. The mean discriminant score on the function for participants with a help-seeking history was -0.29. In other words, the MANOVA and post hoc DA showed that STEM students without a help-seeking history scored significantly higher on the Value barrier than STEM students with a help-seeking history.

Discussion

The purpose of the present study was to validate STEM students' scores on the RFSV Scale and investigate demographic correlates with the Fit, Stigma, and Value barriers. The CFA results demonstrated that the RFSV Scale and its dimensions were estimated adequately with a sample of STEM students. This finding is consistent with the existing body of literature on the generalizability

of scores on the RFSV Scale with a number of non-college populations (e.g., Kalkbrenner, Goodman-Scott, & Neukrug, 2020; Kalkbrenner & Neukrug, 2018). In addition to a stringent test of internal structure validity, CFA is also a theory-testing procedure (Mvududu & Sink, 2013). Thus, our CFA results indicated that Fit, Stigma, and Value comprise a tri-dimensional theoretical model of barriers to counseling among STEM students. Consistent with the results of Kalkbrenner and Neukrug (2019), we found support for a higher-order Global Barriers to Counseling scale. The presence of a higher-order factor (see Figure 1, Model 3) indicates that the covariation between the first-order Fit, Stigma, and Value subscales comprises a meta-level latent trait. Collectively, the single-order and higher-order CFA results indicate that Fit, Stigma, and Value are discrete dimensions of an interconnected latent trait. Accordingly, CFA results provided support for the dimensionality of both the single-order RFSV model (see Figure 1, Model 1) and the higher-order model (see Figure 1, Model 3) with STEM students.

STEM students face unique risks for mental health issues, including maladaptive perfectionism as well as intense pressure to perform in harsh and competitive academic environments (Rice et al. 2015; Shapiro & Sax, 2011). These unique risk factors coupled with STEM students' reticence to seek counseling (Kalkbrenner, James, & Pérez-Rojas, 2022) created a need for a screening tool for appraising why STEM students might avoid accessing counseling services. The results of the CFA and HCFA in the present study begin to address the gap in the literature regarding the lack of a screening tool with validated scores for appraising barriers to counseling among STEM students. Our CFA and HCFA results suggest that college counselors can use the RFSV Scale as one way to understand why STEM students on their campus are reluctant to access counseling services.

Consistent with the findings of Kalkbrenner and Neukrug (2019), we found statistically significant differences in peer-to-peer referrals and demographic differences in STEM students' scores on the Value barrier. Specifically, increases in STEM students' belief in the value of attending counseling were associated with significant increases in the odds of making one or more peer referrals to the counseling center, as indicated by the moderate effect size of the finding. It appears that STEM students' attendance in personal counseling increases their propensity for recommending counseling to their peers. Similar to Kalkbrenner and Neukrug (2018), tests of group demographic differences revealed that STEM students in the present study with a help-seeking history were less sensitive to the Value barrier than STEM students without a help-seeking history. These findings indicate that attendance in counseling might enhance STEM students' belief that the effort required to attend counseling is worth the benefits. Perhaps experiencing counseling firsthand increases STEM students' belief in the value of counseling as well as their disposition to refer a peer to counseling. This finding has particularly important implications, as STEM students are a distinct college-based population with unique mental health needs who tend to utilize mental health support services at lower rates than non-STEM students (Kalkbrenner, James, & Pérez-Rojas, 2022; Rice et al., 2015; Shapiro & Sax, 2011). In particular, our results suggest that STEM students who access counseling services usually see value in the process. STEM students' general attitudes about counseling might become more positive if more and more STEM students participate in counseling.

Also, consistent with the findings of Kalkbrenner and Neukrug (2018), we found demographic differences in STEM students' scores on the Value barrier by gender identity, with males attributing less value to attending counseling than females. Macro- and micro-systemic gender role forces tend to contribute to men's reticence to seek counseling (Neukrug et al., 2013). These forces might be intensified among male STEM students considering the intersectionality between gender roles and the high-pressure environment in STEM majors to not show vulnerability (Lipson et al., 2016; Neukrug et al., 2013). Specifically, gender-role pressures to avoid showing vulnerability coupled

with a high-pressure academic environment might make male STEM students especially reluctant to seek counseling. Men are also less likely than women to recognize and seek treatment for mental health issues (Kalkbrenner & Neukrug 2018; Neukrug et al., 2013). Thus, it is also possible that male STEM students are less likely to recognize mental distress as a potentially serious health issue, which contributes to them placing less value on the benefits of counseling when compared to their female counterparts. Future research is needed to test these possible explanations for this finding.

Implications

The findings of this study have a number of implications for professional counselors who work in college settings. The CFA and HCFA results extend the psychometric properties of the RFSV Scale to STEM students (RQ1), which is an important contribution to the measurement literature, as the scale offers professional counselors a brief screening tool that usually takes 10 minutes or less to complete. The RFSV Scale can be administered at the systemic level (e.g., all STEM students at a university). Tests of internal structure reveal support for a three-dimensional RFSV model (see Figure 1, Model 1) as well as a higher-order model (see Figure 1, Model 3) with STEM students. Accordingly, professional counselors can administer and score one or both RFSV models depending on their mental health screening goals. The Global Barriers to Counseling scale might have utility for college counselors who are aiming to gather baseline information about STEM students' general reticence to seek counseling. The three-dimensional model can provide more specific information (Fit, Stigma, and/or Value) about the reasons why STEM students on a particular campus are reluctant to seek counseling.

Our results reveal that increases in STEM students' scores on the Value subscale were associated with a noteworthy increase in the odds of making a peer-to-peer referral to the counseling center. This finding coupled with STEM students' vulnerability to mental distress (Daker et al., 2021; Kalkbrenner, James, & Pérez-Rojas, 2022; Lipson et al., 2016; Shapiro & Sax, 2011) suggests that peer-to-peer referrals to mental health support services might be more important than ever before in connecting STEM students in mental distress to support services. Professional counselors who work in college settings can administer the RFSV Scale to STEM students and use the results as one method of informing the content of peer-to-peer mental health support initiatives. If, for example, STEM students on a particular campus score higher on the Value subscale (higher scores denote less value toward counseling), there might be utility in including information about the many benefits of counseling in peer-to-peer outreach initiatives for STEM students. Specifically, it might be beneficial to discuss both the academic and personal benefits associated with attending counseling. For groups of STEM students who score higher on the Stigma scale, college counselors might take a strengths-based perspective by discussing how attending counseling takes courage and strength.

College counselors and student affairs officials can reach STEM students by partnering with STEM faculty and administrators to attend STEM orientations and classes that are held in large lecture halls. College counselors may build relationships with department heads and program directors of STEM programs through sharing empirical evidence on STEM students' unique mental health needs and their reticence to access mental health support services (Kalkbrenner, James, & Pérez-Rojas, 2022; Lipson et al., 2016; Shapiro & Sax, 2011). College counselors might also discuss how increases in STEM students' mental health is associated with greater retention and academic success, which are key values in STEM programs (Daker et al., 2021; Lockard et al., 2019; Meaders et al., 2020; Muenks et al., 2020). As buy-in from STEM department heads and program directors increases, there might be utility in professional counselors regularly making presentations and facilitating discussions about mental health and the benefits of attending counseling during new STEM student orientations. The content of these presentations can be based on the extant literature regarding the socio-personal factors that can

place STEM students at risk for mental distress—for example, maladaptive perfectionism (Rice et al., 2015), high-pressure academic environments (Shapiro & Sax, 2011), and difficulty recognizing warning signs for mental distress (Kalkbrenner, James, & Pérez-Rojas, 2022). Once STEM students learn about these socio-personal factors, the presentation content can shift to psychoeducation about the utility of counseling for improving both personal and academic outcomes (Lockard et al., 2019).

The RFSV Scale can also be administered on more targeted levels, for example, to specific groups of STEM students who might be particularly vulnerable to mental health distress. There might be utility in administering the RFSV Scale to male STEM students considering that we found male STEM students were more sensitive to the Value barrier than female STEM students. College counselors can use the RFSV results to identify specific barriers (e.g., Value) that might be making STEM students on their campus unlikely to access counseling services. Such results can be used to inform the curriculum of mental health programming (e.g., peer-to-peer support initiatives). When working with male STEM students, college counselors might consider the intersectionality of academic pressure (Lipson et al., 2016) and gender-role-based mental health stressors (Neukrug et al., 2013) they might be facing. In all likelihood, considering the intersectionality between these socio-personal factors will help college counselors address their clients' presenting concerns holistically.

Limitations and Future Research

The methodological limitations of this research should be reviewed when considering the implications of the results. The preset data were collected from STEM students in three different cities located in the Southwestern United States; however, results might not generalize to STEM students in other geographical locations. Future researchers can validate RFSV scores with national and international samples of STEM students. Moreover, the findings of cross-sectional research designs are correlational, which prevents researchers from drawing conclusions regarding cause-and-effect. Now that STEM students' scores on the RFSV Scale are validated, future investigators can extend this line of inquiry by conducting outcome research on the effectiveness of interventions geared toward promoting the utilization of mental health support services among STEM students.

Although factor analytic results in the present study were promising, STEM students are not a homogenous group. To this end, future investigators can extend this line of research by conducting factorial invariance testing to examine the psychometric equivalence of RFSV scores across subgroups of STEM students. As just one example, past investigators (e.g., Shapiro & Sax, 2011) found differences in STEM students' mental health by gender identity. Relatedly, our results did not reveal demographic differences by race/ethnicity in STEM students' vulnerability to barriers to counseling. However, we used a dummy-coding procedure to create racial/ethnic identity comparison groups (Latinx, White, or other ethnicity) that were large enough for statistical analyses. Clustering participants with racial/ethnic identities other than White or Latinx into one group might have masked significant findings within the other race/ethnicity group. It is also possible that some participants identified as White and Latinx, as White is a racial category and Latinx is an ethnic category. Future researchers should examine potential disparities in barriers to counseling among more racially and ethnically diverse samples of STEM students. In an extension of the extant literature on samples of primarily male STEM students, the present study included notably more (> 50%) female STEM students when compared to a national demographic profile of STEM students (NCES, 2020). However, the findings of the present study might not generalize to STEM students with gender identities that extend beyond only male or female. Accordingly, future researchers can test the invariance of RFSV scores with more gender-diverse samples.

The findings of the CFA and HCFA in the present study supported Fit, Stigma, and Value as barriers to counseling among STEM students. However, the deductive nature of quantitative research does not capture the nuances of participants' lived experiences. One way that future investigators can extend this line of research is through qualitative investigations of STEM students' attitudes and values about seeking counseling services. Qualitative results might reveal important nuances and insights into STEM students' propensity to access mental health support services.

Conclusion

To the best of our knowledge, the present investigation is the first to establish the psychometric properties of a barriers to counseling tool with STEM students. The results represent an important contribution to the measurement literature, as confirming the internal structure of test scores on an existing measure with a previously untested population is a vital step in demonstrating construct validity. We also found that decreases in STEM students' reticence to seek counseling was predictive of statistically significant increases in the odds of making a peer referral to the counseling center. In addition, results revealed demographic differences in barriers to counseling among STEM students by gender and help-seeking history. Collectively, our findings suggest that professional counselors who work in college settings can use the RFSV Scale as one way to support STEM college student mental health by identifying why STEM students might be reticent to access counseling services. Supporting STEM students' mental health has implications for increasing their retention rates, completion rates, and overall psychological well-being.

Conflict of Interest and Funding Disclosure

The authors reported no conflict of interest or funding contributions for the development of this manuscript.

References

- Al-Maraira, O. A., & Shennaq, S. Z. (2021). Investigation of depression, anxiety and stress levels of health-care students during COVID-19 pandemic. *Mental Health Review Journal*, 26(2), 113–127. <https://doi.org/10.1108/MHRJ-10-2020-0070>
- Bryan, A. E. B., & Arkowitz, H. (2015). Meta-analysis of the effects of peer-administered psychosocial interventions on symptoms of depression. *American Journal of Community Psychology*, 55(3–4), 455–471. <https://doi.org/10.1007/s10464-015-9718-y>
- Byrom, N. (2018). An evaluation of a peer support intervention for student mental health. *Journal of Mental Health*, 27(3), 240–246. <https://doi.org/10.1080/09638237.2018.1437605>
- Caporale-Berkowitz, N. A. (2022). Let's teach peer support skills to all college students: Here's how and why. *Journal of American College Health*, 70(7), 1921–1925. <https://doi.org/10.1080/07448481.2020.1841775>
- Daker, R. J., Gattas, S. U., Sokolowski, H. M., Green, A. E., & Lyons, I. M. (2021). First-year students' math anxiety predicts STEM avoidance and underperformance throughout university, independently of math ability. *NPJ Science of Learning*, 6(1), Article 17. <https://doi.org/10.1038/s41539-021-00095-7>
- Dimitrov, D. M. (2012). *Statistical methods for validation of assessment scale data in counseling and related fields*. American Counseling Association.
- Hong, V., Busby, D. R., O'Chel, S., & King, C. A. (2022). University students presenting for psychiatric emergency services: Socio-demographic and clinical factors related to service utilization and suicide risk. *Journal of American College Health*, 70(3), 773–782. <https://doi.org/10.1080/07448481.2020.1764004>

- Kalkbrenner, M. T., Goodman-Scott, E., & Neukrug, E. S. (2020). Validation of high school students' scores on the Revised Fit, Stigma, and Value Scale: Implications for school counseling screening. *Professional School Counseling, 23*(1). <https://doi.org/10.1177/2156759X20912750>
- Kalkbrenner, M. T., James, C., & Pérez-Rojas, A. E. (2022). College students' awareness of mental disorders and resources: Comparison across academic disciplines. *Journal of College Student Psychotherapy, 36*(2), 113–134. <https://doi.org/10.1080/87568225.2020.1791774>
- Kalkbrenner, M. T., Lopez, A. L., & Gibbs, J. R. (2020). Establishing the initial validity of the REDFLAGS Model: Implications for college counselors. *Journal of College Counseling, 23*(2), 98–112. <https://doi.org/10.1002/jocc.12152>
- Kalkbrenner, M. T., & Neukrug, E. S. (2018). Identifying barriers to attendance in counseling among adults in the United States: Confirming the factor structure of the Revised Fit, Stigma, & Value Scale. *The Professional Counselor, 8*(4), 299–313. <https://doi.org/10.15241/mtk.8.4.299>
- Kalkbrenner, M. T., & Neukrug, E. S. (2019). The utility of the Revised Fit, Stigma, and Value Scale with counselor trainees: Implications for enhancing clinical supervision. *The Clinical Supervisor, 38*(2), 262–280. <https://doi.org/10.1080/07325223.2019.1634665>
- Kalkbrenner, M. T., Neukrug, E. S., & Esquivel, L. E. (2022). Mental health literacy screening of students in Hispanic Serving Institutions. *Journal of Counseling & Development, 100*(3), 319–329. <https://doi.org/10.1002/jcad.12428>
- Kalkbrenner, M. T., Neukrug, E. S., & Griffith, S. A. (2019). Appraising counselor attendance in counseling: The validation and application of the Revised Fit, Stigma, and Value Scale. *Journal of Mental Health Counseling, 41*(1), 21–35. <https://doi.org/10.17744/mehc.41.1.03>
- Kalkbrenner, M. T., Sink, C. A., & Smith, J. L. (2020). Mental health literacy and peer-to-peer counseling referrals among community college students. *Journal of Counseling & Development, 98*(2), 172–182. <https://doi.org/10.1002/jcad.12311>
- Kivlighan, D. M., III, Schreier, B. A., Gates, C., Hong, J. E., Corkery, J. M., Anderson, C. L., & Keeton, P. M. (2021). The role of mental health counseling in college students' academic success: An interrupted time series analysis. *Journal of Counseling Psychology, 68*(5), 562–570. <https://doi.org/10.1037/cou0000534>
- Lipson, S. K., Zhou, S., Wagner, B., Beck, K., & Eisenberg, D. (2016). Major differences: Variations in undergraduate and graduate student mental health and treatment utilization across academic disciplines. *Journal of College Student Psychotherapy, 30*(1), 23–41. <https://doi.org/10.1080/87568225.2016.1105657>
- Lockard, A. J., Hayes, J. A., Locke, B. D., Bieschke, K. J., & Castonguay, L. G. (2019). Helping those who help themselves: Does counseling enhance retention? *Journal of Counseling & Development, 97*(2), 128–139. <https://doi.org/10.1002/jcad.12244>
- McNeish, D. (2018). Thanks coefficient alpha, we'll take it from here. *Psychological Methods, 23*(3), 412–433. <https://doi.org/10.1037/met0000144>
- Meaders, C. L., Lane, A. K., Morozov, A. I., Shuman, J. K., Toth, E. S., Stains, M., Stetzer, M. R., Vinson, E., Couch, B. A., & Smith, M. K. (2020). Undergraduate student concerns in introductory STEM courses: What they are, how they change, and what influences them. *Journal for STEM Education Research, 3*(2), 195–216. <https://doi.org/10.1007/s41979-020-00031-1>
- Muenks, K., Canning, E. A., LaCrosse, J., Green, D. J., Zirkel, S., Garcia, J. A., & Murphy, M. C. (2020). Does my professor think my ability can change? Students' perceptions of their STEM professors' mindset beliefs predict their psychological vulnerability, engagement, and performance in class. *Journal of Experimental Psychology, 149*(11), 2119–2144. <https://doi.org/10.1037/xge0000763>
- Mvududu, N. H., & Sink, C. A. (2013). Factor analysis in counseling research and practice. *Counseling Outcome Research and Evaluation, 4*(2), 75–98. <https://doi.org/10.1177/2150137813494766>
- National Center for Educational Statistics. (2020). *Science, Technology, Engineering, and Mathematics (STEM) education, by gender*. <https://nces.ed.gov/fastfacts/display.asp?id=899>
- Neukrug, E., Britton, B. S., & Crews, R. C. (2013). Common health-related concerns of men: Implications for counselors. *Journal of Counseling & Development, 91*(4), 390–397. <https://doi.org/10.1002/j.1556-6676.2013.00109>

- Neukrug, E. S., Kalkbrenner, M. T., & Griffith, S.-A. M. (2017). Barriers to counseling among human service professionals: The development and validation of the Fit, Stigma, & Value (FSV) Scale. *Journal of Human Services, 37*(1), 27–40. https://digitalcommons.odu.edu/cgi/viewcontent.cgi?article=1016&context=chs_pubs
- Olson, K., Koscak, G., Foroudi, P., Mitalas, E., & Noble, L. (2016). *Recognize and refer: Engaging the Greek community in active bystander training. College Student Affairs Journal, 34*(3), 48–61. <https://doi.org/10.1353/csaj.2016.0018>
- Rice, K. G., Ray, M. E., Davis, D. E., DeBlaere, C., & Ashby, J. S. (2015). Perfectionism and longitudinal patterns of stress for STEM majors: Implications for academic performance. *Journal of Counseling Psychology, 62*(4), 718–731. <https://doi.org/10.1037/cou0000097>
- Rincon, B. E., & George-Jackson, C. E. (2016). STEM intervention programs: Funding practices and challenges. *Studies in Higher Education, 41*(3), 429–444. <https://doi.org/10.1080/03075079.2014.927845>
- Schreiber, J. B., Nora, A., Stage, F. K., Barlow, E. A., & King, J. (2006). Reporting structural equation modeling and confirmatory factor analysis results: A review. *The Journal of Educational Research, 99*(6), 323–338. <https://doi.org/10.3200/JOER.99.6.323-338>
- Schwitzer, A. M., Moss, C. B., Pribesh, S. L., St. John, D. J., Burnett, D. D., Thompson, L. H., & Foss, J. J. (2018). Students with mental health needs: College counseling experiences and academic success. *Journal of College Student Development, 59*(1), 3–20. <https://doi.org/10.1353/csd.2018.0001>
- Shapiro, C. A., & Sax, L. J. (2011). Major selection and persistence for women in STEM. *New Directions for Institutional Research, 2011*(152), 5–18. <https://doi.org/10.1002/ir.404>
- U.S. Department of Education. (2020). *Science, technology, engineering, and math, including computer science. <https://www.ed.gov/stem>*
- Warne, R. (2014). A primer on multivariate analysis of variance (MANOVA) for behavioral scientists. *Practical Assessment, Research, and Evaluation, 19*, 1–10. <https://doi.org/10.7275/sm63-7h70>
- Wawrzynski, M. R., LoConte, C. L., & Straker, E. J. (2011). Learning outcomes for peer educators: The national survey on peer education. *Emerging Issues and Practices in Peer Education, 2011*(133), 17–27. <https://doi.org/10.1002/ss.381>
- Woodhead, E. L., Chin-Newman, C., Spink, K., Hoang, M., & Smith, S. A. (2021). College students' disclosure of mental health problems on campus. *Journal of American College Health, 69*(7), 734–741. <https://doi.org/10.1080/07448481.2019.170653>