Simultaneous Factor Analysis and Item Response Theory Analysis of Center for Epidemiological Studies Depression Scale (CES-D) and Quick Inventory of Depressive Symptomatology Self Report (QIDS-SR)

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Dedication & Acknowledgements

I dedicate this proposal to my mother, whom I love and cherish, and am forever thankful for.

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Abstract

The Center for Epidemiological Studies – Depression Scale (CES-D) and the Quick Inventory of Depressive Symptomatology – Self-Report (QIDS-SR) are psychological tests designed to assess depression symptoms. The psychometric properties of both scales have been examined using both Classical Test Theory (CTT) and Item Response Theory (IRT), and both have been demonstrated to be effective instruments. Previous evidence would suggest that each scale performs better at different depression symptom severities; the CES-D performed better at lower levels while the QIDS-SR performed better at higher levels. This study examined the viability of combining items from both scales to create a measure that would assess a broader range of depressive symptom severity using unidimensional IRT. In order to perform an IRT analysis, both scales would have to meet certain assumptions, namely unidimensionality and local independence. Previous studies have established that the QIDS-SR is a unidimensional scale, while the evidence for the CES-D have shown varying levels of multidimensionality. While problematic, previous studies have shown that a unidimensional IRT analysis can still be done with a multidimensional scale given that it adequately fits a one factor model. An Exploratory Factor Analysis (EFA) was conducted to determine if the combined CES-D & QIDS-SR scale met that assumption. A graded response model (GRM) IRT analysis was completed for the CES-D and QIDS-SR items to examine item level characteristics, namely the item’s ability to discriminate between individuals of varying levels of the higher order latent factor, as well as the amount of information that an item obtains relative to the respective scales. Results showed that the combined CES-D &QIDS-SR scale adequately fit a one factor model, enabling the use of unidimensional IRT analysis. The IRT analysis found that the combined scale did not seem to broaden the assessment range of depression levels. Furthermore, the IRT analysis
showed that certain items from both scales performed poorly in its discriminatory function and amount of information obtained.
Introduction

The Center for Epidemiological Studies – Depression Scale (CES-D) is one of the most widely used depression symptoms inventory in psychological research (Edwards, Cheavens, Heiy, & Cukrowicz, 2010). It has been studied extensively with a number of different population samples, including both adult and children non-clinical, adult and children clinical, military veterans, pregnant women, and various ethnic groups (Whitton & Whisman, 2010; Proulx, Buehler, & Helms, 2009; Renshaw, Rodrigues, & Jones, 2008; Boisvert, McCreary, Wright, & Asmundson, 2003; Hann, Winter, & Jacobsen, 1999; Orme, Reis & Herz, 1986; Radloff, 1977). Those studies have yielded strong Classical Test Theory (CTT) psychometric evidence (i.e., internal consistency, test-retest reliability, convergent, and construct validity) for the CES-D. While less studied than the CES-D, the Quick Inventory of Depressive Symptomatology – Self-Report (QIDS-SR) has also seen extensive use in clinical research and has been demonstrated to have adequate CTT psychometric properties (Reilly, MacGillivray, Reid, & Cameron, 2014; Trivedi et al., 2004; Rush et al., 2003; Cameron et al., 2003).

However, the limitations of CTT methods are that it does not provide information on a measure’s ability to accurately measure differences in severity of a particular latent factor. Knowledge about the range of severity assessed by an instrument can help researchers modify scales to accurately address questions pertaining to the target latent factor across specific settings (Olino et al., 2012). That information can be discovered through the use of item response theory (IRT) (Embretson & Reise, 2000).

IRT allows researchers to model levels of a latent factor (e.g. depression) as a function of item characteristics, such as item difficulty and discrimination (Olino et al., 2012). IRT provides estimates for an item’s ability to obtain the most information based on the intensity of a specified
latent factor. This latent factor intensity is defined in IRT as theta level (θ), which are then reported as z-scores. Parameter estimates in IRT models can be integrated to yield item- and test-information functions. These functions are then graphed to illustrate the areas where the latent factor is most accurately assessed. Item- and test-information parameters in IRT are estimated on the same latent factor (i.e., standardized to have a mean = 0 and standard deviation [SD] = 1) (Reise & Henson, 2003). Thus, results from IRT analyses can be used to directly compare multiple measures on a standardized metric.

Previous studies have examined the CES-D and the QIDS-SR using IRT. A number of different studies have used IRT with the purpose of linking the CES-D to other measures of depression (Choi, Schalet, Cook, & Cella, 2014; Olino et al., 2013; Stansbury, Ried, & Velozo, 2006; Orlando, Sherbourne, & Thissen, 2000). Choi et al., 2014 set out to develop a common reporting metric for depression symptoms by linking several depression scales (The CES-D among them) to the Patient-Reported Outcomes Measurement Information System (PROMIS) depression scale. Overall, they found that the CES-D was highly comparable to the PROMIS measure, as well as the BDI-II, and PHQ-9, and thus creating a metric to compare results from one scale to another. Their results also suggested that the CES-D performs best when assessing low – moderate depressive symptom severity in a general population sample. Furthermore, it was found that 15 of the 20 CES-D items tapped into similar constructs of their target measure (i.e., PROMIS-depression), with the remaining items measuring somatic symptoms (Choi et al., 2014). They go on to suggest that by combining the items, it is possible to assess different symptoms and wider ranges of depression severity. Olino et al., 2013 had similar goals, with the intention of linking the PROMIS to the CES-D and other depression measures in adolescent populations, while Orlando et al., 2000 looked to link the original CES-D to a 23-item CES-D.
Stansbury et al., 2006 had a different goal in mind, as they examined the unidimensionality of the CES-D and used 1-PL Rasch IRT to model an improved scale. In their study, they found that the CES-D departed from a unidimensional structure due to the presence of positive affect items. Their IRT analysis found that removing those positive affect items improved the scale’s ability to assess depressive risk (Stansbury et al., 2006). In contrast to the information range discovered by Choi et al., 2014, the CES-D was found to provide the most information when depression symptom severity was low in both non-clinical adolescent samples (Olino et al., 2013) and clinical adult sample (Orlando et al., 2000). These studies would seem to suggest that the CES-D performed best when assessing lower to moderate depression levels. This makes sense, since the scale was originally designed for epidemiological studies (Radloff, 1977). However, the studies also indicate that the CES-D by itself may not be the best inventory for measuring severe depression symptoms.

With regards to the QIDS-SR, one study was found using IRT with a clinical adolescent sample (Bernstein et al., 2010). In their study, they found that the QIDS-SR provided the most information at moderate to high levels of depression severity. This would also suggest that the QIDS-SR does not perform well at lower depression levels. Given the relative weaknesses and strengths of each individual scales at different depression levels, it would seem that the two might complement each other well. It would then make sense to combine the items to create a measure that can assess a wider range of depressive symptom severity. While that is beyond the scope of the current study, perhaps the results from this study may be useful in informing the creation of such a scale. No current studies have linked the CES-D and QIDS-SR.

To employ IRT, the scales in question must meet the assumptions of unidimensionality and local independence. Previous studies suggests strong evidence of unidimensionality and
local independence of the QIDS-SR (Reilly et al., 2014), with one exception in the Chinese
version of the QIDS-SR (Liu et al., 2014). The evidence for the CES-D is more varied. While the
CES-D was not created to include formal subscales, the items were designed to tap into nine
depression symptom classifications (Radloff, 1977). Generally, most studies examining the CES-
D factor structure supported a four factor model (Carleton et al., 2013; Shafer, 2006; Cole,
Rabin, Smith, & Kaufman, 2004; Bush, Novack, Schneider, & Madan, 2004; Carpenter et al.,
1998; Radloff, 1977). However, another meta-analysis on studies examining race/ethnicity
differences in the factor structures of the CES-D did not replicate a four factor model (Kim,
Huang, DeCoster, & Chiriboga, 2011). Instead, their meta-analysis suggested that the CES-D
factor structure differs between different ethnic groups. Some studies examining a predominantly
Western sample found a two-dimension structure due to the inclusion positive affect items
(Edwards, Cheavens, Heiy, & Cokrowicz, 2010; Stansbury et al., 2006). Of further interest to
this study, Edwards et al., 2010 proposed that a one-factor model for the CES-D is plausible with
all items, and would be a well fitted model if 5 items were dropped. Other studies that examined
first- and second- generation Levantine samples found the best fit to be a three-factor model
(Amer, Mona, Awad, Hovey, 2014; Demirchyan, Petrosyan, Thompson, 2011). Of interest to the
current study sample, there were differences found within various female samples. One study by
Canady, Stommel, & Holzman, 2009, found supporting evidence for the two-factor model in a
sample of pregnant African-American & Caucasian women. However, another study looking
into a sample of pregnant Hispanic women yielded a four-factor model (Lara & Navarrete,
2012). The four-factor model was also found to be the best fitting model in a sample of non-
pregnant African-American women (Makambi, Williams, Taylor, Rosenberg, & Adams-
Campbell, 2009). See Table 1. The differences may also be due to gender differences, as studies
have found gender bias on items measuring crying and hope (MacIntosh & Strickland, 2010; Gelin & Zumbo, 2003). Another found gender differences in responses to CES-D items about interpersonal problems (Yang, Tommet, & Jones, 2009). However, there seems to be some conflicting data, as another study looking into the role of gender found a non-significant effect (Johnson, McLeod, Sharpe, Johnston, 2008). With that said, gender differences are not an anticipated problem in the current study, as the sample is mostly homogeneous.

With the dimensionality of the CES-D is unclear, the first goal of the current research was to discover the factor structure of the scale with this sample. A factor analysis may be useful in determining the dimensionality, as the sample consists of a novel population. The potential existence of a multidimensional factor structure may to cause problems for a unidimensional IRT analysis. However, a unidimensional IRT analysis can still be conducted when the assumptions are approximately met. According to Mislevy, 1993, it is viable to assume model robustness and proceed with an IRT analysis, as it may still yield an accurate representation. As a precedent, Stansbury et al., 2006 described the impossibility of strict unidimensionality in real world data. They proposed that adequate fit for a one factor model would be enough to gain meaningful results from a unidimensional IRT analysis, and based their study on that assumption.

Furthermore, a study on model selection indicated that it is impossible to find a “correct” or “true” factor structure, suggesting that model selection should be based on “approximate correctness” based on the researcher’s study goals (Preacher, Zhang, Kim, Mels, 2013). For this study, model robustness was assumed, and with adequate fit in the EFA, the unidimensional IRT analysis was conducted.

**STATISTICAL METHODS**
EFA and IRT analyses were conducted to investigate the nature of the scales at the item level. EFA uncovers the underlying constructs called factors, and can find the dimensionality of the scales. First, the EFA was conducted using items from both CES-D and QIDS-SR to examine whether the two scales measure the same construct. If the two scales do indeed measure the same construct, it is expected that the items from each scales will load onto consensus factor loadings. Conversely, if the instruments measure different constructs, it would be expected to find heterogeneous factor loadings for their respective items. Furthermore, simultaneous EFA on both scales may reveal multi-dimensional nature of the items when they are combined. As discussed earlier, previous studies that applied EFA on the QIDS-SR have almost unanimously found evidence that the scale is unidimensional (Reilly et al., 2014). However, that has not been the case with the CES-D. As such, it is important to factor analyze the current CES-D data to determine the factor structure with sample. This is done to ensure that the CES-D data adequately fits a one factor model. IRT analysis was then employed to further investigate the detailed nature of the items.

**Exploratory Factor Analysis**

EFA is one of the most frequently used statistical methods in multivariate analysis to model the sample variance-covariance matrix with relatively few number of unobserved (latent) variables called factors compared as the number of items (Pett, Lackey, & Sullivan, 2003). In this sense, EFA can be regarded as a statistical method for data reduction from p observed variables into m factors, where the number of factors m is much smaller than the number of observed variables p.

*Identifying the number of factors*
In achieving the goal of data reduction, the appropriate number of factors need to be identified. There have been many methods to identify the number of factors, however, the following two methods have been used most extensively (Hoyle & Duvall, 2004). One is called the eigenvalue-greater-than-one rule, in which the number of eigenvalues of the sample correlation matrix that are greater than one is chosen as the number of factors. The rationale behind it is that in the correlation matrix, the variance of each variable is standardized to one, so that any factor whose eigenvalue greater than explain the amount of variance larger than any single observed variable. However, it has been known that the eigenvalue-greater-than-one rule typically to find too many factors. Another frequently used method to identify the number of factors is called the scree plot (Cattell, 1966), which is the plot of the eigenvalues of the sample correlation matrix in the ordered fashion, from the largest to the smallest. Then, the so-called elbow where eigenvalues later on are almost the same in magnitude can be discovered. In this method, the number of eigenvalues just before the elbow are then considered as the number of factors.

Finding an initial solution

Once the number of factors have been identified, an extraction (i.e., estimation) method will be employed to obtain the initial solution of factor loadings and error variances called the unique variances. The proportion of variance in each item explained by m factors when m is the number of factors, is called communality, and in essence, the finding the initial solution can be summarized as finding the communalities for p items. For extraction methods, either principal factor (i.e., principal axis) method or the maximum likelihood method is the most frequently used.

Rotation for a simple structure
Thurstone (1947) introduced the term called the simple structure, and claimed that the goal of EFA is to find the simple structure. Here, the simple structure means the pattern of factor loadings that are easy to interpret. For example, if each item has only one large factor loading on only one out of m factors, it becomes the most obvious that on which factor the item belongs. To achieve such a simple structure, a variety of so-called the rotational methods have been introduced (Browne, 2001). The rotational methods are classified into two groups. The first group assumes that the factors are uncorrelated with each other, and such rotations are called orthogonal rotations. The single most used orthogonal rotation is the varimax rotation (Kaiser, 1958) in which the factor loadings are rotated in such that the variance of squared factor loadings is maximized. In this way, large loadings are separated from small loadings, and a simple structure is achieved. Another category of rotations is called the oblique rotations in which factors are assumed to be correlated. This is in general a more natural assumption because many unobserved latent variables are often correlated. For example, it is known that language factor and the mathematical factor in the standardized tests such as SAT and GRE are positively correlated. Again, there are several methods for oblique rotations, but among the easiest to compute is called the promax rotation (Hendrickson & White, 1964). To obtain the promax rotated solution, the varimax solution is first obtained, and emphasize the varimax solution by raising the varimax-rotated factor loadings to the power of either 3 or 4. This is done to emphasize the differences between large and small loadings, and try to use the power-raised factor loadings as the target matrix. The loadings are then rotated as closely as possible to the target matrix.

*Factor patterns, factor structure, and inter-factor correlations*
If an oblique rotation is employed, so called factor loadings are no longer obtained. Instead, the solutions gained are both factor patterns and factor structures. Here, factor patterns mean standardized regression coefficients of observed variables on the factors, whereas, factor structures are correlations between factors and observed variables. Whenever an orthogonal rotation is employed, the factor patterns and factor structures are identical. They must then be distinguished. In this method, the correlation matrix among the factors is also obtained. One objective of this study is to determine the viability of a one factor model for the CES-D.

**Item Response Theory**

Once the identity of the factor structure was found via EFA, the IRT analysis was conducted. The unique features of IRT are discussed as follow.

IRT is a statistical method developed for the purpose of analyzing a particular scale at the item level. Compared to CTT, IRT provides information for inclusion of particular items on a test (Embretson & Reise, 2000). An IRT analysis of a particular item examines the probability of a subject endorsing an item response based on a latent factor level (Embretson & Reise, 2000). For example, items on an inventory designed to measure depressive symptoms have a higher probability of endorsement by subjects who are depressed versus those who are not depressed.

There are several advantages to using IRT over CTT in examining psychometric properties of a particular scale. One of the limitations of CTT is that the factor level where a particular item discriminates the best is determined by the number of subjects who positively endorse the item. With CTT, a relatively large number of items is needed to achieve a high level of reliability. This is not the case with IRT, as high reliability can be achieved with a relatively
small number of items. As a result, IRT can facilitate the development of shorter scales with greater measurement precision (Mislevy, 1993).

Assumptions

Theoretically, there are assumptions that a scale must meet in order to apply a standard IRT model. The two most common assumptions are the assumption of unidimensionality and local independence. The assumption of unidimensionality requires a one factor model, which is the reason for employing EFA prior to the use of IRT model. The assumption of local independence requires that responses to the items are independent given the subject's factor level. A problem arises, as real world scales are unlikely to meet these assumptions perfectly. This is the case with the multidimensional nature of the CES-D. However, an IRT analysis can be conducted when the assumptions are approximately met. It is viable to assume model robustness and proceed with an IRT analysis, as it may still yield an accurate representation (Mislevy, 1993).

Model and Parameters

The most commonly used IRT model is the two-parameter logistic (2-PL) model (Embretson & Reise, 2000). The model parameters are called discrimination ($a$) and difficulty ($b$) parameters, and they describe the slope and center of each model.

The $b$ or difficulty parameter indicates the point on the factor ($\theta$) where there is equivalent chance (50%) for a subject to endorse or not endorse a response. The $b$ parameter indicates where on the scale that the item best discriminates between subjects with a high and low level of the latent factor. High $b$ parameters indicate that the particular item is most sensitive to subjects with a high level of the latent trait. The $a$ or slope parameter determines how well the
item can distinguish between subjects with a high factor level and those with a low factor level. High \(a\) parameters indicate a greater discrimination ability of the particular item.

*Item Characteristic Curve*

IRT analysis describes the probability of a subject with a given factor level, to endorse a specified response to an item. This probability can be described in the form of a function called the Item Characteristic Curve (ICC). The ICC graphs the probability that a subject, at a given factor level, will select a specified response to an item (Embretson & Reise, 2000; Mislevy, 1993). A typical ICC is graphed with the factor level represented on the horizontal axis in standardized Z-score units and the probability of a particular response on the vertical axis; from 0.0 to 1.0. See **Figure 1** for an example of a typical ICC.

*Information and Item Information Curve*

Information is defined as the reciprocal of squared standard error (SE) with which a parameter is estimated (Embretson & Reise, 2000). If the parameter is estimated with high precision (i.e., small SE), more information is available about the parameter than if it was estimated with low precision. The Item Information Curve (IIC) describes the amount of information obtained at differing factor levels (Embretson & Reise, 2000). For example, items that are designed to detect subjects with an average factor level should yield the most information where the standardized factor level is approximately equal to zero. The height of the IIC is determined by the slope of the item in question; the higher the slope, the higher the IIC.

*Polytomous Items*

Many psychological assessment tools require polytomous responses typically found in the form of Likert scales. IRT can also be applied to understanding these items. The most
commonly used IRT model for polytomous item responses is the Graded Response Model (GRM) (Samejima, 1969). Analogous to 2PL, GRM has one discrimination parameter and a set of difficulty parameters where each parameter is a between-category “threshold.” The discrimination parameter $a$ indicates the shape of the category response curves, with higher discrimination parameters yielding steeper curves. The number of $b$ parameters needed is defined as $k - 1$, where $k$ is the total number of possible responses. For example, $k$ is equal to 5 for a 5-point Likert scale, in which case the number of needed $b$ parameters is $5 - 1 = 4$. For a polytomous item, the $b$ parameter indicates the threshold between one categorical response and the next. The ICC charts the probability of selecting each particular response based on the subject’s factor level. For our purposes, a Graded Response Model (GRM), was employed.

**Research Goals**

While the ultimate goal would be to create a measure that can assess a wider range of depression symptom severity, several questions must first be answered.

In this study, the aim was to investigate whether the CES-D and QIDS-SR measure the same underlying construct or factors. One of the research questions is whether a single factor of depression would be found even when the items from the two scales are combined. To answer this question, an EFA was conducted.

Once the factor structure of the combined item set was fitted to a one factor model, the next goal was to examine each of the individual items comprising each factor. Which items are considered to be “difficult” items, in that only subjects who would be considered to be highly depressed endorse? In other words, which items would be most useful in determining whether a person is depressed? Which items are then considered to be “easy” items so that even healthy
subjects would typically endorse (i.e., less “useful” items)? Also, another question that can be answered via IRT concerns how well the items detect the subjects’ depression levels around the levels where they perform the best. In order to answer these questions, a GRM IRT analysis was employed to determine the item characteristics such as item discrimination, item difficulty, and both item and factor-level information.

**Methods**

*Participants*

Participants for the study were spouses of US military soldiers who had returned from deployment to either Operation Enduring Freedom (OEF) or Operation Iraqi Freedom (OIF). While her study concerned only spouses of Reserve component and National Guard soldiers, spouses of Active soldiers from other U.S. military branches (e.g., Army, Marines, Navy, Air Force, & Coast Guard) also took part in the survey. Her data was collected between the dates of February 2011 – April 2012.

Recruitment was done primarily by J’Anthony and her team of research assistants. All of the recruitment materials and portions of the online survey included in this proposal’s appendices were created by J’Anthony. The original study collected the data online via Surveymonkey.com, an online survey service. Participants were recruited through a variety of different methods. Emails, letter mailings, and telephone calls were made to various agencies (e.g., medical centers, churches) to recruit spouses connected with said agencies. An email detailing the study as well as providing a link to the survey website was sent to organizations connected with military families.
(e.g., Family Readiness Groups) along with a letter to the individual members (Appendix A). Emails were also sent to online spouse organizations (Appendix B) and to spouse blogs located online (Appendix C) requesting recruitment assistance. A blog webpage (armyspousesurvey.com; Appendix D) was created by J’Anthony to provide information about the study and a direct link to the Surveymonkey.com survey. Online recruitment efforts targeting Reserve Component spouses and Reserve Component spouse organizations were made through social network sites such as Facebook, MySpace (Appendix E), and Twitter (Appendix F). Press releases (Appendix G) were submitted to newspapers, online spouse blogs, Army spouse magazines, Army spouse organizations, and community radio stations. J’Anthony participated in an on-air interview with Beth-Ann Kozlovich on Hawai‘i Public Radio’s Town Square to provide information and recruit prospective participants. Flyers (Appendix H) were distributed at Yellow Ribbon events in Honolulu, Hawai‘i. Flyers were also distributed at table events set up at the Hawai‘i Pacific University downtown campus and the University of Hawai‘i at Mānoa. Additionally, flyers were placed on university campuses and other community centers on O‘ahu. Finally, J’Anthony presented and distributed flyers at the University of Hawai‘i at Mānoa Responding to Student Diversity: Understanding Service Members and Veterans conference.

The total number of potential participants who accessed the online survey was N = 549. Out of the 549 potential participants, 547 provided their informed consent to participate in the original study. Of those who gave informed consent, 329 participants provided at least one response on the QIDS-SR, with 324 completing all items on the QIDS-SR. Within the 329 participants who completed at least one item on the QIDS-SR, 295 also provided a response for at least one item on the CES-D. Of those 295 who filled out at least one item on both the QIDS-
SR and CES-D, 290 completed all items on the CES-D. Two other participants who completed all items on the CES-D did not provide responses to any QIDS-SR items.

Of the 329 participants who were eligible to participate in the present study, 320 (97.2%) reported their gender was female, while 8 (2.4%) reported their gender was male. One (0.3%) participant endorsed both male and female as their gender. The average age of participants was 36.2 years, with a range of 21 – 60 years old (SD = 9.03). In terms of race/ethnicity, participants were 284 Non-Hispanic White (86.3%), 20 Hispanic (6.0%), 9 Native American (2.7%), 4 African American (1.2%), 3 Asian (0.9%), 1 Native Hawaiian (0.3%), while 14 participants (4.3%) either reported “Other” or did not provide a response. One hundred fifty participants (45.6%) had at least attended some college, while 113 earned a Bachelor’s degree or an advanced degree (34.3%). Out of the 329 participants, 286 (86.9%) were married and living with their spouse, 26 (7.9%) were not married but living with their partners, 12 (3.6%) were married but separated, 1 (0.3%) were widowed, and 4 (1.2%) did not provide a response. Annual household income for the participants were reported as followed: 66 (20.0%) earned less than $30,000; 103 (31.3%) earned between $30,001 and $50,000; 62 (18.8%) earned between $50,001 and $70,000; 42 (12.8%) earned between $70,001 and $90,000; and 40 (12.2%) earned more than $90,000. Participants’ employment statuses were reported as thus: 109 (33.1%) were employed full-time; 74 (22.4%) were employed part-time; 51 (15.5%) were unemployed and looking for work; and 103 (31.3%) were unemployed but not looking for work. See Table 2 for a summary.

Data Collection Procedure

Once potential participants access the Surveymonkey.com survey, they are presented with the Informed Consent page (Appendix I, p. 34 – 35). Participants were then given the option
to proceed to the demographic questions or to begin on the instructions page on how to erase their web browser history (Appendix I, p. 36 – 37). As part of a larger battery lasting approximately 25 minutes, participants completed the CES-D and the QIDS-SR.

Measurement Instruments

Quick Inventory of Depressive Symptomatology Self-Report (QIDS-SR; Rush et al., 2003)

The QIDS-SR is a 16-item self-report instrument designed to measure depressive symptoms in a 7-day time period, based on the DSM-IV-TR criterion symptoms for major depressive disorder (IDS/QIDS Instruments in English and Multiple Translations (IDS/QIDS), n.d.; Appendix I, p. 42 – 43)). It was derived from the 30-item Inventory of Depressive Symptomatology (IDS; Rush et al., 2003). Although the original instrument assesses for depressive symptoms in the past week, the current version assessed the previous 2 weeks. Conversations with the primary investigator revealed no recollection of the reason for changing the scale’s timeframe; human error was proposed as a possible reason (personal communications, October 30, 2014). The QID-SR includes one or more items measuring each of the DSM-IV-TR 9 criterion symptoms: depressed mood, loss of interest or pleasure, concentration/decision making, self- outlook, suicidal ideation, energy/fatigability, sleep, weight/appetite change, and psychomotor changes. Each item is rated on a Likert scale ranging from 0 (non-symptomatic) – 3 (the most severe choice for the symptom) (See Table 3 for actual QIDS-SR anchors). Although there are 16 items, only one item’s score (the highest score) within each symptom domain is used to calculate the total scale score. The total scale score for the QIDS-SR ranges from 0 – 27 (IDS/QIDS, n.d.). The cut-off scores for the QIDS-SR are as followed: no symptoms (0 – 5), mild depressive symptoms (6 – 10), moderate depressive symptoms (11 –15), severe depressive symptoms (16 – 20), and finally very severe depressive symptoms (21 – 27) (IDS/QIDS, n.d.).
With regards to CTT, internal consistency for use with outpatients was found to be $\alpha = 0.86$ (Trivedi et al., 2004; Rush et al., 2003). Cameron et al, 2013 found internal consistency scores ranging from $\alpha = 0.80 - 0.89$ in a sample of depressed primary care outpatients. For this sample, the QIDS-SR was found to have excellent internal consistency ($\alpha = 0.93$). Convergent validity of the QIDS was supported through studies finding significant correlations with the Hamilton Rating Scale for Depression (HAM-D) in a sample of outpatients ($r = .79 - .84$; Cameron et al., 2013; Rush et al., 2003). The QIDS-SR was also found to have excellent norms, internal consistency and test-retest reliability, as well as good content and construct validity, and generalizability (Persons & Fresco, 2008).

**Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977)**

The CES-D is a 20-item self-report instrument designed to measure depressive symptoms within a time period of 14 days (Appendix I, p. 44). Although the original version uses a timeline of 2 weeks, J’Anthony’s online survey assessed a 7 day period. J’Anthony’s version also omits 2 items from the original CES-D; the items measuring talkativeness and loneliness respectively. Like with the QIDS-SR, the primary investigator could not recall the purpose for the change in the instrument’s measurement timeframe or the omission of the two items (personal communications, October 30, 2014). Each item is rated on a Likert scale ranging from 0 (rarely or none of the time) – 3 (most or all of the time). Total scale score ranges from 0 – 60 with higher scores indicating higher severity of depressive symptoms. A cut-off score of 16 or higher has been determined to indicate clinical depression in community samples (Knight, Williams, McGee & Olaman, 1997; Radloff, 1977).

The CES-D was designed for use in research with the general population and it is considered to be one of the best measures for screening depressive symptoms (Joiner, Walker,
Pettit, Perez, & Cukrowicz, 2005). With regards to CTT psychometrics, the CES-D has been shown to have excellent internal consistency ($\alpha = 0.84 - 0.92$) across various samples (Whitton & Whisman, 2010; Proulx et al., 2009; Renshaw et al., 2008; Boisvert et al., 2003; Hann, Winter, & Jacobsen, 1999; Orme, et al., 1986; Radloff, 1977). The internal consistency of the CES-D with this sample was found to be excellent ($\alpha = 0.99$). Test-retest reliability of the CES-D was found to be $r = .67$ at four weeks and $r = .49$ at 12 months (Radloff, 1977).

Convergent validity was established via significant correlations between the CES-D and the HAM-D ($r = 0.44 - 0.69$), between the CES-D and the Raskins Rating Scale ($r = 0.54 - 0.75$), and between the CES-D and the Symptom Checklist – 90 (SCL-90; $r = 0.83$) (Radloff, 1977). Hann et al., (1999) supported the discriminant validity of the CES-D in their study using clinical and healthy samples. It is noted for its good internal consistency, test-retest reliability, construct validity, and generalizability (Fiske & O’Riley, 2008).

**Analysis**

As described above, an EFA was conducted of all items from the two questionnaires combined. First, the number of factors was identified using a scree plot. The initial solution was obtained using the maximum likelihood extraction method. By analyzing the outcome of the EFA, the contents of the factor structure was identified. Secondly, item analysis using a GRM IRT model was done to investigate the characteristics of each item separately. For the EFA, SPSS version 22 was the software used. For the IRT, MPlus version 7.1 was used (Muthen & Muthen, 2010).
RESULTS

Exploratory Factory Analysis

An ML estimation method was employed for the EFA of the combined QIDS-SR and CES-D items. First, a correlation matrix was generated to check for potential problems with multicollinearity. A visual scan of the correlation matrix showed no indications of any correlation coefficients above $r = 0.9$ (See Table 4). As such, it was concluded that no problems with multicollinearity should be expected with this data.

The EFA yielded seven factors with eigenvalues greater than one (with eigenvalues of 10.735, 2.115, 1.660, 1.456, 1.307, 1.210, and 1.067). However, the scree plot showed that the slope of eigenvalues leveled off from the second factor and suggested that a single factor model fits the data, with the first eigenvalue by far the largest compared to the other eigenvalues (See Figure 2).
Scree plot for EFA of CES-D & QIDS-SR items

As can be expected from a one-factor model, many of the items had high factor loadings (i.e., greater than .500), including QIDS-SR items 1, 5, 6, 7, 9, 10, 11, 12, 13, and 14, and CES-D items 1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 15, 16, 17, and 18 (See Table 5 for the factor loadings). In contrast, QIDS-SR item 2 and 4, which appears to assess specific sleep symptoms (continuity of sleep and sleeping too much), had relatively small factor loadings of less than .300 (0.265 and 0.160, respectively). This suggests that deleting or modifying these items may improve overall performance of the combined scale. In spite of the exceptions, the factor analysis strongly supported the concept of a one-factor model. Thus, it was concluded that a unidimensional item response theory analysis was appropriate for this data, and proceeded with generating a unidimensional IRT model.

Table 5.

Factor loadings of CES-D & QIDS-SR items

<table>
<thead>
<tr>
<th>Item</th>
<th>ITEM WORDING</th>
<th>LOADINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>QIDS1</td>
<td>Falling asleep</td>
<td>0.506*</td>
</tr>
<tr>
<td>QIDS2</td>
<td>Staying asleep during the night</td>
<td>0.265</td>
</tr>
<tr>
<td>QIDS3</td>
<td>Waking up too early</td>
<td>0.347*</td>
</tr>
<tr>
<td>QIDS4</td>
<td>Sleeping too much</td>
<td>0.160</td>
</tr>
<tr>
<td>QIDS5</td>
<td>Feeling sad</td>
<td>0.764*</td>
</tr>
<tr>
<td>QIDS6</td>
<td>General interest</td>
<td>0.778*</td>
</tr>
<tr>
<td>QIDS7</td>
<td>Appetite (in the last 2 weeks)</td>
<td>0.518*</td>
</tr>
<tr>
<td>QIDS8</td>
<td>Weight change (within the last two weeks)</td>
<td>0.370*</td>
</tr>
<tr>
<td>QIDS9</td>
<td>Concentration/Decision making</td>
<td>0.706*</td>
</tr>
<tr>
<td>QIDS10</td>
<td>Energy level</td>
<td>0.692*</td>
</tr>
<tr>
<td>QIDS11</td>
<td>Feeling restless</td>
<td>0.558*</td>
</tr>
<tr>
<td>QIDS12</td>
<td>Feeling slowed down</td>
<td>0.670*</td>
</tr>
<tr>
<td>QIDS13</td>
<td>View of myself</td>
<td>0.653*</td>
</tr>
<tr>
<td>QIDS14</td>
<td>Thoughts of death or suicide</td>
<td>0.718*</td>
</tr>
<tr>
<td>CESD1</td>
<td>I was bothered by things that usually don’t bother me.</td>
<td>0.758*</td>
</tr>
<tr>
<td>CESD2</td>
<td>I did not feel like eating; my appetite was poor.</td>
<td>0.704*</td>
</tr>
<tr>
<td>CESD3</td>
<td>I felt that I could not shake off the blues even with help from my family or friends.</td>
<td>0.795*</td>
</tr>
<tr>
<td>CESD4</td>
<td>I felt I was just as good as other people.</td>
<td>0.460*</td>
</tr>
<tr>
<td>CESD5</td>
<td>I had trouble keeping my mind on what I was doing.</td>
<td>0.719*</td>
</tr>
</tbody>
</table>
Item Response Theory

Following the EFA, the IRT analysis was conducted to examine the item-level characteristics of the combined scales. Because the items used a four-point Likert scale, the IRT analysis consisted of estimating four parameters (one a & three b parameters). Furthermore, Item Characteristic Curves (ICCs) and the Item Information Curves (IICs) were generated for each item (See Appendix XXX). Overall, the ICCs and IICs for each of the items are centered at the middle level of the latent trait (mean b = -0.006, SD = 0.961). This indicates that the average b parameter is approximately at the mean level of the latent trait. QIDS-SR items 5, 6, & 14, and CESD-D items 1, 3, 6, 9, 16, & 18 have estimated discrimination parameters greater than 2.0. This indicates that these items are considered to be good at distinguishing people with differing levels of the latent factor. QIDS-SR items 1, 7, 9, 10, 11, 12, 13, & 14, and CES-D items 2, 7, 8, 10, 11, 12, 13, 14, 15, & 17 have estimated discrimination parameters that fell between 1.0 - <2.0, suggesting adequate to good discriminating ability. Only QIDS items 2, 3, & 4 have estimated discrimination parameters lower than 1.0, indicating poor discriminating ability. These
are the items assessing specific sleeping problems, namely difficulties with sleeping through the night, waking up too early, or sleeping too much.

In regards to item difficulty (i.e., b parameter), QIDS-SR items 3, 4, 6, 11, 12, 13, & 14, and CES-D items 1, 2, 3, 6, 9, 10, 13, 15, & 17 have positive values for all three parameter estimates. This suggests that those items are most sensitive to those with higher-than-average levels of the latent factor. Noteworthy are QIDS-SR item 3 \((b_2 = 2.891, b_3 = 3.019)\) item 4 \((b_1 = 5.279, b_2 = 13.574, b_3 = 19.416)\), & item 14 \((b_2 = 3.004, b_3 = 3.701)\), as those items have very high estimated b parameters. QIDS-SR items 1, 2, 5, 7, 8, 9, & 10, along with CES-D items 4, 5, 7, 8, 11, 12, 14, 16, & 18 have both positive and negative estimated b parameters. This suggests that those items are most sensitive to individuals with moderate latent factor levels. Gleaned further, QIDS-SR item 2 \((b_1 = -4.762, b_2 = -1.132)\) is the only item with high negative estimated difficulty parameters, indicating that this particular item was most sensitive to persons with low latent factor levels. (See Table 6).

*Table 6.*  

**Item parameter estimates from the two-parameter logistic model**

<table>
<thead>
<tr>
<th>Item Number</th>
<th>a</th>
<th>b&lt;sub&gt;1&lt;/sub&gt;</th>
<th>b&lt;sub&gt;2&lt;/sub&gt;</th>
<th>b&lt;sub&gt;3&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>QIDS1</td>
<td>1.005</td>
<td>-0.987</td>
<td>0.091</td>
<td>1.360</td>
</tr>
<tr>
<td>QIDS2</td>
<td>0.424</td>
<td>-4.762</td>
<td>-1.132</td>
<td>3.019</td>
</tr>
<tr>
<td>QIDS3</td>
<td>0.577</td>
<td>1.345</td>
<td>2.891</td>
<td>4.470</td>
</tr>
<tr>
<td>QIDS4</td>
<td>0.19</td>
<td>5.279</td>
<td>13.574</td>
<td>19.416</td>
</tr>
<tr>
<td>QIDS5</td>
<td>2.163</td>
<td>-0.644</td>
<td>1.046</td>
<td>2.355</td>
</tr>
<tr>
<td>QIDS6</td>
<td>2.283</td>
<td>0.255</td>
<td>1.436</td>
<td>2.205</td>
</tr>
<tr>
<td>QIDS7</td>
<td>1.076</td>
<td>-0.229</td>
<td>1.350</td>
<td>2.534</td>
</tr>
<tr>
<td>QIDS8</td>
<td>0.687</td>
<td>-0.476</td>
<td>1.151</td>
<td>2.753</td>
</tr>
<tr>
<td>QIDS9</td>
<td>1.766</td>
<td>-0.168</td>
<td>1.262</td>
<td>2.835</td>
</tr>
<tr>
<td>QIDS10</td>
<td>1.736</td>
<td>-0.521</td>
<td>1.027</td>
<td>2.513</td>
</tr>
<tr>
<td>QIDS11</td>
<td>1.282</td>
<td>0.051</td>
<td>1.746</td>
<td>2.708</td>
</tr>
<tr>
<td>QIDS12</td>
<td>1.651</td>
<td>0.884</td>
<td>1.952</td>
<td>3.515</td>
</tr>
<tr>
<td>QIDS13</td>
<td>1.603</td>
<td>0.556</td>
<td>1.482</td>
<td>1.777</td>
</tr>
<tr>
<td>QIDS14</td>
<td>2.059</td>
<td>1.843</td>
<td>3.004</td>
<td>3.701</td>
</tr>
<tr>
<td>CESD1</td>
<td>2.089</td>
<td>0.258</td>
<td>1.299</td>
<td>2.278</td>
</tr>
<tr>
<td>CESD2</td>
<td>1.794</td>
<td>0.647</td>
<td>1.586</td>
<td>2.271</td>
</tr>
<tr>
<td>CESD</td>
<td>Value 1</td>
<td>Value 2</td>
<td>Value 3</td>
<td>Value 4</td>
</tr>
<tr>
<td>-------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td>CESD3</td>
<td>2.477</td>
<td>0.270</td>
<td>1.068</td>
<td>1.832</td>
</tr>
<tr>
<td>CESD4</td>
<td>0.824</td>
<td>-0.110</td>
<td>0.971</td>
<td>1.893</td>
</tr>
<tr>
<td>CESD5</td>
<td>1.844</td>
<td>-0.387</td>
<td>0.867</td>
<td>1.838</td>
</tr>
<tr>
<td>CESD6</td>
<td>3.111</td>
<td>0.064</td>
<td>0.887</td>
<td>1.646</td>
</tr>
<tr>
<td>CESD7</td>
<td>1.796</td>
<td>-0.176</td>
<td>0.764</td>
<td>1.620</td>
</tr>
<tr>
<td>CESD8</td>
<td>1.279</td>
<td>-0.189</td>
<td>0.902</td>
<td>2.093</td>
</tr>
<tr>
<td>CESD9</td>
<td>2.044</td>
<td>0.810</td>
<td>1.668</td>
<td>2.347</td>
</tr>
<tr>
<td>CESD10</td>
<td>1.852</td>
<td>0.740</td>
<td>1.693</td>
<td>2.397</td>
</tr>
<tr>
<td>CESD11</td>
<td>1.33</td>
<td>-0.947</td>
<td>0.225</td>
<td>1.307</td>
</tr>
<tr>
<td>CESD12</td>
<td>1.939</td>
<td>-0.214</td>
<td>0.914</td>
<td>1.959</td>
</tr>
<tr>
<td>CESD13</td>
<td>1.222</td>
<td>0.503</td>
<td>1.780</td>
<td>2.949</td>
</tr>
<tr>
<td>CESD14</td>
<td>1.832</td>
<td>-0.264</td>
<td>0.939</td>
<td>1.954</td>
</tr>
<tr>
<td>CESD15</td>
<td>1.684</td>
<td>0.255</td>
<td>1.517</td>
<td>2.594</td>
</tr>
<tr>
<td>CESD16</td>
<td>3.278</td>
<td>-0.265</td>
<td>0.937</td>
<td>1.780</td>
</tr>
<tr>
<td>CESD17</td>
<td>1.865</td>
<td>0.459</td>
<td>1.508</td>
<td>2.264</td>
</tr>
<tr>
<td>CESD18</td>
<td>2.083</td>
<td>-0.229</td>
<td>0.808</td>
<td>1.790</td>
</tr>
</tbody>
</table>
Next, the ICCs and IICs are examined to provide a more in-depth analysis of the item characteristics. As previously mentioned, ICCs graph the probability of a response choice being endorsed given a specified latent factor level. IICs on the other hand, graph the amount of information (i.e., estimation power) gained by an item at different levels of the latent factor.

*Item Characteristic Curves*

**QIDS-SR:** Several items appeared to function like a dichotomous item, with the majority of participants endorsing either one category or the other. These items include items 1, 8, and 12.

The ICC for QIDS-SR item 1 appears to center at low levels of the latent factor, with the majority of participants endorsing either category 1 or 4. Item 8 also had the majority of participants choosing category 1 or 4, though it centered at moderate levels of the latent factor.

Item 12 centered at higher levels of the latent factor, with only category 1 & 3 reached .50 probability. Three items seemed to center at negative levels of the latent factor, namely items 2, 3, and 4. Item 2 only had category 4 reaching .5 probability of endorsement when the latent factor is above z-score of 2.5. For items 3 & 4, only category 1 reached .50 probability of endorsement. Items 5 and 13 appeared to center at moderate levels of the latent factor, with item 13’s category 3 showing very low (~.10) probability of being endorsed. A number of items appeared to center in the higher levels of the latent factor (Items 5, 6, 9, 10, 11, and 14). Item 6 displayed a typical ICC, with only category 3 failing to reach .50 probability of endorsement.

Item 7 operated somewhat like a dichotomous item, with only categories 1 & 4 reaching .50 probability of endorsement. Items 9, 10, & 11 all displayed typical ICCs where all categories reached .5 probability of endorsement based on latent factor levels. Item 14 seems to be skewed toward very high levels of the latent factor (centered z > 2.5). See Figure 3 – Figure 16.
**CES-D:** All CES-D item ICCs displayed typical curves (i.e., all categories reaching .5 probability of endorsement) unless otherwise specified. Item 4 centered at moderate levels of the latent factor, but again appeared to operate like a dichotomous item. Item 11 was unique, as it seemed to center at relatively low levels of the latent factor compared as other items ($\theta \approx 0.25$). Items 5, 6, 7, 8, 12, 14, 16, and 18 appeared to center at moderate levels of the latent factor. Items 1, 2, and 3 appeared to center at moderate – high levels of the latent factor. Of those items, item 2 was unique in that category 3 had low probability (~.3) of being endorsed. Items 9, 10, 13, and 17 seemed to center at high levels of the latent factor. With regards to item 13, it also functioned as a dichotomous item, with categories 2 & 3 failing to reach .50 probability of endorsement. See Figure 17 – Figure 34.

**Item Information Curves**

**QIDS-SR:** Item 1 appeared to peak at item information level $\approx 0.3$, while providing the most information between -0.5 and 1.0 of the latent factor level. Item 2, 3, & 4 appeared to peak at information level of 0.05 and 0.1 respectively, suggesting that they are poor items that provide little information. Item 5 had a peak item information level of 1.2 between $\theta$ levels of -0.5 and 2.5, and this item seemed a good item on distinguishing people with different ranges of latent factor. Item 6 had a peak item information level of 1.5, while providing most of its information between latent factor levels 0.0 and 2.0. Item 7 seemed to provide the most information between latent factor levels -0.5 and 2.5, with a peak information level of 0.4. Item 8 had a peak item information level of 0.15 between $\theta$ levels of -0.5 through 2.5. Item 9 appeared to have a peak information level of0.8, while providing the most information when the latent factor level is between latent factor levels of 0 through 2.5. Item 10 had a peak item information level of 0.8, while providing most of its information between latent factor levels -0.5 through 2.5. Item 11
appeared to peak at item information level of 0.5, while providing the most information between 0.5 and 2.5 of the latent factor level. Item 12 seemed to provide the most information between latent factor levels of 1.0 through 2.0, with a peak information level of 0.8. Item 13 had an information level of 0.8, while providing the most information between 1.0 and 2.0 latent factor levels. Item 14 had a peak item information level of 1.2, while providing much of its information between latent factor levels 2.0 and 3.0. **Figure 3 – Figure 16.**

**CES-D:** Item 1 peaked at item information level of 1.2, while providing the most information between 0.0 and 2.5 of the latent factor level. Item 2 seemed to provide the most information between latent factor levels 1.0 and 2.0, with a peak information level of 1.0. Item 3 had a peak item information level of 1.8, while providing most of its information between latent factor levels of 0.0 and 2.0. Item 4 had a peak information level of 0.2, providing the most information between θ levels of 0.5 and 1.5. Item 5 had a peak item information level of 1.0 between θ levels of -0.5 and 2.0. Item 6 had an especially high peak item information level of 2.6, while providing most of its information between latent factor levels of 0.0 and 2.0. Item 7 seemed to provide the most information between latent factor levels 0.0 and 1.5, with a peak information level of 1.0. Item 8 had a peak item information level of 0.5 between θ levels of 0.0 and 2.0. Item 9 appeared to have a peak information level of 1.2, while providing the most information between 1.0 and 2.5 latent factor levels. Item 10 had a peak item information level of 1.0, while providing most of its information between latent factor levels of 1.0 and 2.5. Item 11 appeared to peak at item information level of 0.5, while providing the most information between -0.5 and 1.5 latent factor levels. Item 12 seemed to provide the most information between latent factor levels of 0.0 and 2.0, with a peak information level of 1.0. Item 13 had an information level of 0.5, while providing the most information between 1.0 and 2.5 latent factor levels. Item 14 had a peak item
information level of 1.0, while providing much of its information between latent factor levels of 0.0 and 2.0. Item 15’s peak information level was 0.8, which fell between latent factor levels of 0.5 and 2.5. Item 16 is another item with two high peaks item information level (2.8), providing the most information between latent factor levels of -0.5 and 0.0, and also between 1.0 and 2.0. Item 17 had a peak item information level of 1.0 between latent factor levels of 0.5 – 2.0. Lastly, item 18 had a peak information level of 1.2, with the most information coming between latent factor levels of 0.0 and 2.0. **Figure 17 – Figure 34**

*Test Information Curve*

Finally, the TIF for the QIDS-SR peaked at information level of 8.4, while providing the most information for people at relatively high latent factor levels (θ between 1.5 and 2.2). The TIF for the CES-D peaked at 20 information level, while providing the most information at relatively high latent factor levels (θ between 1.0 and 2.0). Finally, the TIF for the QIDS-SR and the CES-D combined peaked at 30 information level, while providing the most information between 1.0 and 2.0 latent factor levels. See **Figure 35 – Figure 37**.

**DISCUSSION**

Overall, the IRT analysis revealed that the CES-D performed best at moderate to high levels of depression severity, while the QIDS-SR provided the most information at moderate to very high depression levels. The results here contrast the findings of previous IRT studies examining the CES-D, where the CES-D was found to provide the most information at low to moderate depression levels (Choi et al., 2014; Olino et al., 2014; Orlando et al., 2010). With regards to the QIDS-SR, the results seem to be more in line with the one past study using IRT (Bernstein et al., 2010). When combined, the test information function suggests that the
combined scale would provide the most information at moderate to high depression symptom severity. These results were unexpected, given the expectations of finding the CES-D to perform best at lower depression levels and the QIDS-SR to perform best at moderate to high depression levels. As such, it was expected that the combined scale would have widened in its ability to measure a broader depressive symptom range, such as what might have been expected with the PROMIS and CES-D somatic items in the study by Choi et al., 2014. With the results, it does not seem that combining the scales would create a measure that can assess a wider range of depression severity. This does suggest that the scale would be more appropriate for use with clinical samples.

The shape of the ICCs for most of the CES-D items suggested that items functioned well. The same cannot be said of the QIDS-SR, as 6 items displayed abnormal ICCs, suggesting problems in that item’s ability to discriminate between different levels of the latent factor. Three of the items seemed to function similarly to dichotomous items, where the middle categories were rarely endorsed. This would suggest that the middle categories those items did not contribute much to the discrimination function of the item. The particular items in question assessed the participants’ problems with falling asleep, problems with weight change, and problems with “slowing down” respectively. In this case, participants endorsed either they had no problems or a lot of problems with these issues, whereas items assessing similar symptoms on the CES-D functioned like a 4 category item. Three other items on the QIDS-SR (namely, the items assessing specific sleeping problems) displayed ICC curves that suggested poor discriminatory function of the item’s categories as a whole. Taken together, this would suggest that the CES-D possesses greater discriminatory ability when compared to the QIDS-SR. While the previous studies have not reported ICCs, the information can still be gleaned from the
reported difficulty thresholds. Overall, the results for the CES-D seem to be in line with the thresholds reported by Choi et al., 2014 and Olino et al., 2013. Conversely, the results for the QIDS-SR contrasted with the thresholds reported by Bernstein et al., 2010. Perhaps the QIDS-SR performs better with adolescent samples than adult samples. Unfortunately, the IRT literature with the QIDS-SR is very limited making it difficult to find insight from previous studies.

As such, it can be expected that the CES-D to better differentiate symptom severity than the QIDS-SR. This is due to the larger number of CES-D items having superior discriminability when compared to QIDS-SR items. This suggests that the CES-D items were more precise in measuring depression symptom severity. The CES-D also possesses a lesser number of poor items. This all contributes to the CES-D providing more information overall than the QIDS-SR. It is unknown why this disparity exists. One reason for this may be the uniform category anchors used by the CES-D (i.e., same category anchors across all items) versus the item specific anchors used by the QIDS-SR. While there are no IRT studies comparing the CES-D and the QIDS-SR, perhaps results from studies comparing the CES-D with another measure that uses item specific anchors (e.g., Beck Depression Inventory- II) may be generalizable. The two previous studies that examined both the CES-D and BDI-II in conjunction both found the BDI-II to provide more information at higher depression levels (Choi et al., 2014; Olino et al., 2012). This of course, contrasts the results found in this study. As such, perhaps only future studies comparing the CES-D and QIDS-SR directly may provide a reason for the distinction.

With regards to the IRT analysis, there were a few standouts from each scale. QIDS-SR items 5, 6, & 14, along with all CES-D items except items 4, 11, & 15, had item information levels greater than 1.0. This indicated that these items are particularly strong items, in that they contribute the most information to the overall scale score on an individual item basis.
especially the case with CES-D items 6 & 16, as they both have item information levels above 2.0. CES-D item 6 measures feelings of depression while item 16 measures feelings of sadness. These items would appear to tap directly into the depression construct, and thus is unsurprising to find that they have high information levels. Unfortunately, the previous IRT studies on these individual scales did not provide specific item IICs.

Conversely, QIDS-SR items 2, 3, & 4, along with CES-D item 8, have item information levels less than 0.2. This suggests that they are poor performing items. QIDS-SR item 4 had the lowest item information level of 0.002, suggesting that it provided little to no information. This indicates that perhaps eliminating the item or reworking the item would improve the performance of the scale as a whole. The QIDS-SR items in question here measure specific difficulties with sleep, while the CES-D item in question assessed hope about the future. A potential reason for the poor performance of the QIDS-SR items might be that participants are experiencing only one category of sleeping problems, and thus endorsement may be spread out across the three items, skewing the results. While sleep problems are a subset of symptoms of depression, it is possible that the sleep problems reported by this particular sample are unrelated to depression. Sleep problems are not mutually exclusive to depression, as they are also featured in other disorders and are specific disorders in of themselves (DSM-5, 2013).

In addition to the QIDS-SR items measuring sleep issues, the CES-D item measuring hopelessness also performed poorly. One reason the hopelessness item performed poorly could be that it is not explicitly a symptom of depression. Rather, it may be associated with worthlessness and suicidal ideation. One study found support for a mediating relationship between depression and hopelessness, where hopelessness mediated the relationship between depression and negative dependent events (i.e., conflicts with friends and family) (Kleiman, Liu,
Riskind, & Hamilton, 2015). This suggests that hopelessness may be a separate construct from depression.

Perhaps another possible explanation for the different results found in this study may be the sample from which the data was collected; the sample consisted of only military spouses. There are no current studies examining the CES-D or QIDS-SR using IRT with military spouses. While limited in number, there have been previous studies looking at depression symptoms in military spouses. One review by Verdeli et al, 2011 found that military spouses experienced more diverse stressors than compared to civilian samples. This suggests that the factor structure and profile of depressive symptoms in this population may be different to those of the general population. However, there are no current IRT or factor analysis studies for depression scales with military spouses.

Results from the EFA of this data supported a one-factor model for the combined scales, implying that the items in both measure a single construct. Based on the item descriptions, it can be concluded that the scales measure depressive symptoms as defined by the DSM-IV-TR (American Psychiatric Association 2000). While the one factor model fitted well when examining the scree plot, the fit indices were only adequate, suggesting that it may possibly be improve by retaining more factors. One potential factor might have been the previously mentioned sleep problem items on the QIDS-SR, which did load onto the one factor highly nor did the items provide much information. This is contrasted by the high factor loadings of the sleep item on the CES-D. This overall result of a single-factor model differs from previous literature, specifically for the CES-D, which had been found to contain multiple factors. The single most likely reason for the difference in the discrepancies may be due to the fact that the items from the two scales were combined, and as a result the common component between the
two scales dominated in the factorial structure. Another potential reason for the difference could be the use of a non-clinical sample. The participants in the original study were recruited from the community, with no information about current or past diagnoses being obtained. One more potential cause might be the large case of missing data, 37 in total. In this analysis, no imputations were completed. Doing so may have resulted in somewhat different factor structure. Note that the four-category items was treated as ordered categorical items in MPlus software, rather than continuous variables. This may imply that our analysis is more accurate than when the items are treated as continuous, which is the case with SPSS software. In psychology, it is common that ordered categorical items are treated as if they were continuous, and they go through an EFA.

**Limitations**

Unfortunately, there are some major limitations to the current study. First, according to the original online survey, different timelines (e.g., Querying mood in the past 7 days) were used with the CES-D and QIDS-SR than what was originally designed (J’Anthony, 2013). The primary investigator used a time period of 14 days with the QIDS-SR (developed for use with a 7 day time period) and a time period of 7 days with the CES-D (developed with a 14 day time period in mind) respectively. As previously stated, personal communications with the primary investigator did not shed light on why this was done, other than perhaps human error. This may have potentially resulted in the participants answering differently. Furthermore, 2 items assessing talkativeness and loneliness were omitted from the CES-D on the original online survey (personal communications, October 30, 2014). Again, the primary investigator was unsure why the items were omitted. These changes in administration method along with the item omissions may be a reason for the differences found in this study. Furthermore, the missing items make it
difficult if not impossible to generalize the findings of the current study. With that said, the results from this study should provide a glimpse at how linking the full CES-D and QIDS-SR may look. Furthermore, the item characteristics found can help test developers improve the CES-D and QIDS-SR in future iterations.

Another limitation of this study is the use of a unique population sample. While this study will help add to the available literature on military spouse populations, the generalizability of the findings may be diminished. Along the same lines, the lack of a clinical sample also limits the generalizability of these findings to treatment samples. Future studies with both general populations & clinical populations will be more useful with the purpose of generalizability in mind.

The self-report methodology used also comes with many limitations. One of the major challenges for researchers who use self-report methods is ascertaining the credibility of the information gathered. Unfortunately, accuracy is not the only motive shaping self-perceptions (Sedikides & Strube, 1995). Other motivators include consistency seeking, self enhancement, and self-presentation (Robins and John, 1997). Even when participants are doing their best to be forthright, their responses may still be inaccurate due to factors such as self-deception and memory (Paulhus, Vazire, 2007).

Unique issues are raised by Internet surveys (Gosling, Vazire, Srivastava, John, 2004). While online surveys offer many advantages over in-person paper surveys and interviews, there are disadvantages to using this particular method. When conducting online research, little information may be known about participants in online communities other than demographics. As the data is self-reported, there is no guarantee that participants from previous surveys provided accurate demographic or characteristics information (Dillman, 2000; Stanton, 1998).
Self-selection bias is another major limitation of online survey research, as there are those who are more likely to complete online surveys than others (Stanton, 1998). Accessibility is another limitation to online surveys, as not all participants may have access to the required technology, or even have the knowledge to use said technology (Andrews, Nonnecke, & Preece, 2003). This may limit the sample to participants who are more technologically savvy than others. With these limitations in mind, future studies may also opt to include a more traditional survey approach.

Beyond sampling limitations, the EFA suggested the possibility of a multidimensional factor structure. While the goal of the EFA in this study was not to determine the most generalizable or replicable model, the existence of other possible factors suggest that the results of the IRT in this study may have been different if they were taken into consideration (Preacher et al, 2013). Future studies may consider determining the most approximately correct factor structure, and assuming multiple factors exist, applying unidimensional IRT to each of the individual factors rather than the whole combined item sets.
### Table 1.

**CES-D Factor Analysis Results with Different Samples**

<table>
<thead>
<tr>
<th>Sample</th>
<th>Sample Size</th>
<th>Factor N</th>
<th>Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Armenian Adults</td>
<td>N = 2025</td>
<td>3</td>
<td>Depressed/Somatic, Interpersonal, Positive Affect</td>
</tr>
<tr>
<td>Second-generation Arab Americans</td>
<td>N = 119</td>
<td>3</td>
<td>Depressed/Somatic, Interpersonal, Positive Affect</td>
</tr>
<tr>
<td>Pregnant African American and Caucasian women</td>
<td>N = 750</td>
<td>2</td>
<td>Depressive Symptoms, Positive Affect</td>
</tr>
<tr>
<td>Pregnant Hispanic women</td>
<td>N = 98</td>
<td>4</td>
<td>Depressed Affect, Interpersonal Relationships, Positive Affect, Lack of Energy/Somatic</td>
</tr>
<tr>
<td>African American women</td>
<td>N = 690</td>
<td>4</td>
<td>Depressed Affect, Interpersonal Relationships, Positive Affect, Somatic</td>
</tr>
</tbody>
</table>
**Table 2.**

**Demographics**

<table>
<thead>
<tr>
<th></th>
<th>N = 329</th>
<th>Percentage</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>320</td>
<td>97.2</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>8</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>1</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td>36.2 (SD = 9.03; 21 – 60yo)</td>
</tr>
<tr>
<td><strong>Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>284</td>
<td>86.3</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>20</td>
<td>6.0</td>
<td></td>
</tr>
<tr>
<td>Native American</td>
<td>9</td>
<td>2.7</td>
<td></td>
</tr>
<tr>
<td>African American</td>
<td>1</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Other/No response</td>
<td>14</td>
<td>4.3</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some college</td>
<td>150</td>
<td>45.6</td>
<td></td>
</tr>
<tr>
<td>Bachelor’s or higher</td>
<td>113</td>
<td>34.3</td>
<td></td>
</tr>
<tr>
<td><strong>Marital Status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married</td>
<td>286</td>
<td>86.9</td>
<td></td>
</tr>
<tr>
<td>Not married but living together</td>
<td>26</td>
<td>7.9</td>
<td></td>
</tr>
<tr>
<td>Separated</td>
<td>12</td>
<td>3.6</td>
<td></td>
</tr>
<tr>
<td>Widowed</td>
<td>1</td>
<td>0.3</td>
<td></td>
</tr>
<tr>
<td>Did not respond</td>
<td>4</td>
<td>1.2</td>
<td></td>
</tr>
<tr>
<td><strong>Household income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;$30,000</td>
<td>66</td>
<td>20.0</td>
<td></td>
</tr>
<tr>
<td>$30,001 - $50,001</td>
<td>103</td>
<td>31.3</td>
<td></td>
</tr>
<tr>
<td>$50,001 - $70,000</td>
<td>62</td>
<td>18.8</td>
<td></td>
</tr>
<tr>
<td>$70,001 - $90,000</td>
<td>42</td>
<td>12.8</td>
<td></td>
</tr>
<tr>
<td>&gt;$90,000</td>
<td>40</td>
<td>12.2</td>
<td></td>
</tr>
<tr>
<td><strong>Employment status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed full-time</td>
<td>109</td>
<td>33.1</td>
<td></td>
</tr>
<tr>
<td>Employed part-time</td>
<td>74</td>
<td>22.4</td>
<td></td>
</tr>
<tr>
<td>Unemployed, looking for work</td>
<td>51</td>
<td>15.5</td>
<td></td>
</tr>
<tr>
<td>Unemployed, not looking for work</td>
<td>103</td>
<td>31.3</td>
<td></td>
</tr>
<tr>
<td>Item</td>
<td>ITEM WORDING</td>
<td>Category 1</td>
<td>Category 2</td>
</tr>
<tr>
<td>------</td>
<td>--------------</td>
<td>------------</td>
<td>------------</td>
</tr>
<tr>
<td>QIDS1</td>
<td>Falling asleep:</td>
<td>I never take longer than 30 minutes to fall asleep.</td>
<td>I take at least 30 minutes to fall asleep, less than half the time.</td>
</tr>
<tr>
<td>QIDS2</td>
<td>Staying asleep during the night:</td>
<td>I do not wake up at night.</td>
<td>I wake up at least once a night, but I go back to sleep easily.</td>
</tr>
<tr>
<td>QIDS3</td>
<td>Waking up too early:</td>
<td>Most of the time, I awaken no more than 30 minutes before I need to get up.</td>
<td>More than half the time, I awaken more than 30 minutes before I need to get up.</td>
</tr>
<tr>
<td>QIDS4</td>
<td>Sleeping too much:</td>
<td>I slept no longer than 7-8 hours/night, without napping during the day.</td>
<td>I slept no longer than 10 hours in a 24-hour period including naps.</td>
</tr>
<tr>
<td>QIDS5</td>
<td>Feeling sad:</td>
<td>I didn’t feel sad.</td>
<td>I felt sad less than half the time (3 days or less out of the past 7 days).</td>
</tr>
<tr>
<td>QIDS6</td>
<td>General interest:</td>
<td>There was no change from usual in how interested I was in other people or activities.</td>
<td>I noticed that I was less interested in other people or activities.</td>
</tr>
<tr>
<td>QIDS7A*</td>
<td>Appetite: Decrease</td>
<td>There was no change in my usual appetite.</td>
<td>I ate somewhat less often or smaller amounts of food than usual.</td>
</tr>
<tr>
<td>QIDS7B*</td>
<td>Appetite: Increase</td>
<td>There was no change in my usual appetite.</td>
<td>I felt a need to eat more frequently than usual.</td>
</tr>
<tr>
<td>Question</td>
<td>Description</td>
<td>Level 1</td>
<td>Level 2</td>
</tr>
<tr>
<td>----------</td>
<td>------------------------------------------</td>
<td>---------</td>
<td>---------</td>
</tr>
<tr>
<td><strong>QIDS8A</strong></td>
<td>Weight Change: Decrease</td>
<td>My weight has not changed.</td>
<td>I feel as if I’ve had a slight weight loss.</td>
</tr>
<tr>
<td><strong>QIDS8B</strong></td>
<td>Weight Change: Increase</td>
<td>My weight has not changed.</td>
<td>I feel as if I’ve had a slight weight gain.</td>
</tr>
<tr>
<td><strong>QIDS9</strong></td>
<td>Concentration/Decision making:</td>
<td>There was no change in my usual ability to concentrate or make decisions.</td>
<td>I occasionally felt indecisive or found that my attention wandered.</td>
</tr>
<tr>
<td><strong>QIDS10</strong></td>
<td>Energy level:</td>
<td>There was no change in my usual level of energy.</td>
<td>I got tired more easily than usual.</td>
</tr>
<tr>
<td><strong>QIDS11</strong></td>
<td>Feeling restless:</td>
<td>I didn’t feel restless.</td>
<td>I was often fidgety, wringing my hands, or needed to change my sitting position.</td>
</tr>
<tr>
<td><strong>QIDS12</strong></td>
<td>Feeling slowed down:</td>
<td>I thought, spoke, and moved at my usual pace.</td>
<td>I found that my thinking was more sluggish than usual or my voice sounded dull or flat.</td>
</tr>
<tr>
<td><strong>QIDS13</strong></td>
<td>View of myself:</td>
<td>I saw myself as equally worthwhile and deserving as other people.</td>
<td>I put the blame on myself more than usual.</td>
</tr>
<tr>
<td><strong>QIDS14</strong></td>
<td>Thoughts of death or suicide:</td>
<td>I didn’t think of suicide or death.</td>
<td>I felt that life was empty or wondered if it was worth living.</td>
</tr>
</tbody>
</table>
**Table 4.**

Correlation Matrix of QIDS-SR & CES-D Items

|    | Q1  | Q2  | Q3  | Q4  | Q5  | Q6  | Q7  | Q8  | Q9  | Q10 | Q11 | Q12 | Q13 | C1  | C2  | C3  | C4  | C5  | C6  | C7  | C8  | C9  | C10 | C11 | C12 | C13 | C14 | C15 | C16 | C17 | C18 |
|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|

Q = QIDS-SR  
G = CES-D
**Table 5.**

**Factor loadings of CES-D & QIDS-SR items**

<table>
<thead>
<tr>
<th>Item</th>
<th>ITEM WORDING</th>
<th>LOADINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>QIDS1</td>
<td>Falling asleep:</td>
<td>0.506*</td>
</tr>
<tr>
<td>QIDS2</td>
<td>Staying asleep during the night:</td>
<td>0.265</td>
</tr>
<tr>
<td>QIDS3</td>
<td>Waking up too early:</td>
<td>0.347*</td>
</tr>
<tr>
<td>QIDS4</td>
<td>Sleeping too much:</td>
<td>0.160</td>
</tr>
<tr>
<td>QIDS5</td>
<td>Feeling sad:</td>
<td>0.764*</td>
</tr>
<tr>
<td>QIDS6</td>
<td>General interest:</td>
<td>0.778*</td>
</tr>
<tr>
<td>QIDS7</td>
<td>Appetite (in the last 2 weeks):</td>
<td>0.518*</td>
</tr>
<tr>
<td>QIDS8</td>
<td>Weight Change(within the last two weeks):</td>
<td>0.370*</td>
</tr>
<tr>
<td>QIDS9</td>
<td>Concentration/Decision making:</td>
<td>0.706*</td>
</tr>
<tr>
<td>QIDS10</td>
<td>Energy level:</td>
<td>0.692*</td>
</tr>
<tr>
<td>QIDS11</td>
<td>Feeling restless:</td>
<td>0.558*</td>
</tr>
<tr>
<td>QIDS12</td>
<td>Feeling slowed down:</td>
<td>0.670*</td>
</tr>
<tr>
<td>QIDS13</td>
<td>View of myself:</td>
<td>0.653*</td>
</tr>
<tr>
<td>QIDS14</td>
<td>Thoughts of death or suicide:</td>
<td>0.718*</td>
</tr>
<tr>
<td>CESD1</td>
<td>I was bothered by things that usually don't bother me.</td>
<td>0.758*</td>
</tr>
<tr>
<td>CESD2</td>
<td>I did not feel like eating; my appetite was poor.</td>
<td>0.704*</td>
</tr>
<tr>
<td>CESD3</td>
<td>I felt that I could not shake off the blues even with help from my family or friends.</td>
<td>0.795*</td>
</tr>
<tr>
<td>CESD4</td>
<td>I felt I was just as good as other people.</td>
<td>0.460*</td>
</tr>
<tr>
<td>CESD5</td>
<td>I had trouble keeping my mind on what I was doing.</td>
<td>0.719*</td>
</tr>
<tr>
<td>CESD6</td>
<td>I felt depressed.</td>
<td>0.844*</td>
</tr>
<tr>
<td>CESD7</td>
<td>I felt that everything I did was an effort.</td>
<td>0.701*</td>
</tr>
<tr>
<td>CESD8</td>
<td>I felt hopeful about the future.</td>
<td>0.646*</td>
</tr>
<tr>
<td>CESD9</td>
<td>I thought my life had been a failure.</td>
<td>0.736*</td>
</tr>
<tr>
<td>CESD10</td>
<td>I felt fearful.</td>
<td>0.697*</td>
</tr>
<tr>
<td>CESD11</td>
<td>My sleep was restless.</td>
<td>0.597*</td>
</tr>
<tr>
<td>CESD12</td>
<td>I was happy.</td>
<td>0.883*</td>
</tr>
<tr>
<td>CESD13</td>
<td>People were unfriendly.</td>
<td>0.590*</td>
</tr>
<tr>
<td>CESD14</td>
<td>I enjoyed life.</td>
<td>0.864*</td>
</tr>
<tr>
<td>CESD15</td>
<td>I had crying spells.</td>
<td>0.695*</td>
</tr>
<tr>
<td>CESD16</td>
<td>I felt sad.</td>
<td>0.868*</td>
</tr>
<tr>
<td>CESD17</td>
<td>I felt that people dislike me.</td>
<td>0.728*</td>
</tr>
<tr>
<td>CESD18</td>
<td>I could not get &quot;going&quot;.</td>
<td>0.758*</td>
</tr>
</tbody>
</table>

* Factor loadings > .300
Table 6.

Item parameter estimates from the two-parameter logistic model

<table>
<thead>
<tr>
<th>Item Number</th>
<th>a</th>
<th>b₁</th>
<th>b₂</th>
<th>b₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>QIDS1</td>
<td>1.005</td>
<td>-0.987</td>
<td>0.091</td>
<td>1.360</td>
</tr>
<tr>
<td>QIDS2</td>
<td>0.424</td>
<td>-4.762</td>
<td>-1.132</td>
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Figure 1. Example of a Typical Item Characteristic Curve
Figure 2. Scree plot for EFA of CES-D & QIDS-SR items
Figure 3. QIDS-SR Item 1 Characteristic Curve & Item Information Curve

Figure 4. QIDS-SR Item 2 Characteristic Curve & Item Information Curve

Figure 5. QIDS-SR Item 3 Characteristic Curve & Item Information Curve
Figure 6. QIDS-SR Item 4 Characteristic Curve & Item Information Curve

Figure 7. QIDS-SR Item 5 Characteristic Curve & Item Information Curve

Figure 8. QIDS-SR Item 6 Characteristic Curve & Item Information Curve
Figure 9. QIDS-SR Item 7 Characteristic Curve & Item Information Curve

Figure 10. QIDS-SR Item 8 Characteristic Curve & Item Information Curve

Figure 11. QIDS-SR Item 9 Characteristic Curve & Item Information Curve
Figure 12. QIDS-SR Item 10 Characteristic Curve & Item Information Curve

Figure 13. QIDS-SR Item 11 Characteristic Curve & Item Information Curve

Figure 14. QIDS-SR Item 12 Characteristic Curve & Item Information Curve
Figure 15. QIDS-SR Item 13 Characteristic Curve & Item Information Curve

Figure 16. QIDS-SR Item 14 Characteristic Curve & Item Information Curve

Figure 17. CES-D Item 1 Characteristic Curve & Item Information Curve
Figure 18. CES-D Item 2 Characteristic Curve & Item Information Curve

Figure 19. CES-D Item 3 Characteristic Curve & Item Information Curve

Figure 20. CES-D Item 4 Characteristic Curve & Item Information Curve
Figure 21. CES-D Item 5 Characteristic Curve & Item Information Curve

Figure 22. CES-D Item 6 Characteristic Curve & Item Information Curve

Figure 23. CES-D Item 7 Characteristic Curve & Item Information Curve
Figure 24. CES-D Item 8 Characteristic Curve & Item Information Curve

Figure 25. CES-D Item 9 Characteristic Curve & Item Information Curve

Figure 26. CES-D Item 10 Characteristic Curve & Item Information Curve
Figure 27. CES-D Item 11 Characteristic Curve & Item Information Curve

Figure 28. CES-D Item 12 Characteristic Curve & Item Information Curve

Figure 29. CES-D Item 13 Characteristic Curve & Item Information Curve
Figure 30. CES-D Item 14 Characteristic Curve & Item Information Curve

Figure 31. CES-D Item 15 Characteristic Curve & Item Information Curve

Figure 32. CES-D Item 16 Characteristic Curve & Item Information Curve
Figure 33. CES-D Item 17 Characteristic Curve & Item Information Curve

Figure 34. CES-D Item 18 Characteristic Curve & Item Information Curve
Figure 35. QIDS-SR Test Information Curve

Figure 36. CES-D Test Information Curve
Figure 37. QIDS-SR & CES-D Combined Test Information Curve
Appendix A: Sample Email for Distribution to Members of Army Wives’ Organizations

Dear ____________,

I am a graduate student in the Psychology department at the University of Hawai‘i at Mānoa and I am doing research on Army National Guard and Reserve wives. The purpose of this study is to understand what positive or negative changes may have occurred, if any, in your marital relationship since your Army National Guard or US Army Reserve spouse has returned from military combat in Iraq or Afghanistan. In addition, this study is interested in to what degree you have been satisfied with support from family, friends, and your military unit's family support services.

I would like your members to have an opportunity to participate in this study. Please find an email letter attached that you may send to your members to let them know about the research. The study is set-up as an online survey and is being conducted at the University of Hawai‘i at Mānoa. The principle investigator is Cynthia J’Anthony. If you have any questions about the study, you may contact her through email at csjantho@hawaii.edu.

You may go to the survey by clicking on this link: www.surveymonkey.com or you may copy the link and enter it directly onto your web browser.

Thank you for your consideration to distribute the attached email to your members.

Regards,

Cynthia J’Anthony, MA
PhD. Candidate,
Psychology Department
University of Hawai‘i at Mānoa
Honolulu, Hawai‘i
Attached Sample Email for Recruitment

Dear ____________.

We are doing research on spouses of Army National Guard and Reserve soldiers.

Please help us with our research by participating in our survey.

The purpose of this study is to understand what positive or negative changes may have occurred, if any, in your marital relationship since your Army National Guard or US Army Reserve spouse has returned from deployment to Iraq or Afghanistan. In addition, this study is interested in the degree to which you have been satisfied with support from family, friends, and military family support services.

With your help, this study could help improve support services and increase understanding of challenges faced by spouses of the Army National Guard and Reserve. Your identity is not collected or required and all data is anonymous.

The study is set-up as an online survey and is being conducted at the University of Hawai‘i at Mānoa. The principle investigator is Cynthia J’Anthony, MA who is a Ph.D. candidate in the Psychology Department at the University of Hawai‘i at Mānoa. If you have any questions about the study, please feel free to contact her through email at csjantho@hawaii.edu. CHS Protocol #18746.

To go to the survey click on this link:
http://www.surveymonkey.com/s/ARNG_and_USAR_Spouse_Survey or you may copy the link and enter it directly onto your web browser.

Thank you for your consideration and support in our efforts.

 Regards,

Cynthia J’Anthony, MA
PhD. Candidate,
Psychology Department
University of Hawai‘i at Mānoa
Honolulu, Hawai‘i
Appendix B: Sample Email for Distribution to Online Army Spouse Organizations

Dear ____________.

We are conducting research on spouses of Army National Guard and Reserve soldiers.

The purpose of this study is to understand what positive or negative changes may have occurred, if any, in Army National Guard or US Army Reserve spouses’ marital relationships since their soldier/spouse returned from deployment to Iraq or Afghanistan. In addition, this study is interested in the degree to which the spouses have been satisfied with support from family, friends, and military family support services.

This study could help improve support services and increase understanding of challenges faced by spouses of the Army National Guard and Reserve.

We would like your members to have an opportunity to participate in this study. Members’ identities are not collected or required and all data is anonymous. Please find an email letter attached that you can send to your members to let them know about this opportunity.

The study is set-up as an online survey and is being conducted at the University of Hawai‘i at Mānoa. The principle investigator is Cynthia J’Anthony, MA who is a Ph.D. candidate in the Psychology Department at the University of Hawai‘i at Mānoa. If you have any questions about the study, please feel free to contact her through email at csjantho@hawaii.edu. CHS Protocol #18746.

You may go to the survey by clicking on this link: http://www.surveymonkey.com/s/ARNG_and_USAR_Spouse_Survey or you may copy the link and enter it directly onto your web browser.

Thank you for your consideration and support in our efforts.

Regards,

Cynthia J’Anthony, MA
PhD. Candidate,
Psychology Department
University of Hawai‘i at Mānoa
Honolulu, Hawai‘i
Appendix C: Sample Email for Distribution to Online Army Spouse Blog sites

Dear ____________.

We are conducting research on spouses of Army National Guard and Reserve soldiers.

The purpose of this study is to understand what positive or negative changes may have occurred, if any, in Army National Guard or US Army Reserve spouses’ marital relationships since their soldier/spouse returned from deployment to Iraq or Afghanistan. In addition, this study is interested in the degree to which the spouses have been satisfied with support from family, friends, and military family support services.

This study could help improve support services and increase understanding of challenges faced by spouses of the Army National Guard and Reserve.

We would like your readers to have an opportunity to participate in this study. Your readers’ identities are not collected or required and all data is anonymous. Please find a letter attached that you can send or announce to your readers to let them know about this opportunity.

The study is set-up as an online survey and is being conducted at the University of Hawai‘i at Mānoa. The principle investigator is Cynthia J’Anthony, MA who is a Ph.D. candidate in the Psychology Department at the University of Hawai‘i at Mānoa. If you have any questions about the study, please feel free to contact her through email at csjantho@hawaii.edu. CHS Protocol #18746.

You may go to the survey by clicking on this link: http://www.surveymonkey.com/s/ARNG_and_USAR_Spouse_Survey or you may copy the link and enter it directly onto your web browser.

Thank you for your consideration and support in our efforts.

Regards,

Cynthia J’Anthony, MA
PhD. Candidate,
Psychology Department
University of Hawai‘i at Mānoa
Honolulu, Hawai‘i
Appendix D: Recruitment Website Home Page

Are you an Army National Guard or Army Reserve Spouse? Please help with this research.

About the Research

This study is trying to understand what positive or negative changes may have occurred in your marital relationship since your husband returned home from deployment to Iraq or Afghanistan. Additionally, we want to understand how helpful support from family, friends, and military family support services has been for you.

This study could help improve support services and increase understanding of challenges faced by spouses of the Army National Guard and Reserve.

The study is set-up as an online survey and is being conducted at the University of Hawaii at Manoa. The principle investigator is Cynthia J’Anthony, MA who is a Ph.D. candidate in the Psychology Department at the University of Hawaii at Manoa. If you have any questions about the study, please feel free to contact her through email at cjantho@hawaii.edu. CHS Protocol #18746.

Share this: Facebook 3  Twitter 1  Email

Like this: Be the first to like this.

Edit
Appendix E: Sample Social Networking Site Post Text (i.e. Facebook, MySpace, etc.)

Please help us with our research by participating in our survey.

This study is trying to understand what positive or negative changes may have occurred in your marital relationship since your husband returned home from deployment to Iraq or Afghanistan. In addition, this study’s interest is to understand how helpful support from family, friends, and military family support services has been for you.

With your help, this study could help improve support services and increase understanding of challenges faced by spouses of the Army National Guard and Reserve.

This is an online research study.

To participate, please go to:
http://www.surveymonkey.com/s/ARNG_and_USAR_Spouse_Survey

The study is set-up as an online survey and is being conducted at the University of Hawai’i at Mānoa. The principle investigator is Cynthia J’Anthony, MA who is a Ph.D. candidate in the Psychology Department at the University of Hawai’i at Mānoa. If you have any questions about the study, please feel free to contact her through email at csjantho@hawaii.edu.

CHS Protocol #18746

Photo for Social Networking site page
Appendix F: Sample Twitter Notices

Army National Guard or Reserve Spouses, please take our survey:
www.surveymonkey.com/s/ARNG_and_USAR_Spouse_Survey

Spouse back from OIF/OEF? Take our survey:
www.surveymonkey.com/s/ARNG_and_USAR_Spouse_Survey

ARNG Spouse: Has your spouse returned from OEF/OIF? Please take our survey:
www.surveymonkey.com/s/ARNG_and_USAR_Spouse_Survey

USAR Spouse: Has your spouse returned from OEF/OIF? Please take our survey:
www.surveymonkey.com/s/ARNG_and_USAR_Spouse_Survey
NEW RESEARCH FOCUSES ON POST–DEPLOYMENT EXPERIENCE OF NATIONAL GUARD AND US ARMY RESERVE SPOUSES

The ravages of war often stay with soldiers as they return from Iraq or Afghanistan. Guard and Reserve soldiers return from battle directly into their civilian communities. Now their spouses are on the frontline. Researchers to date have largely ignored these spouses. New research focuses on the post-deployment experience of this neglected population. Support for military families is a timely topic and deserves nationwide attention.

When deployed Guard and Reserve soldiers return from combat they go directly back into civilian communities. Their homes and families are off military bases – often great distances from existing post-combat support systems. Their spouses are thrust into caring for and coping with someone who may have been profoundly affected by combat. Recent studies indicate that Guard and Reserve soldiers experience higher rates of PTSD and suicide than active duty soldiers. How are spouses coping with this? How is it affecting their marriage? Is there volatile behavior in the home? Are spouses experiencing any behavioral health issues? Where do spouses turn for help? Is military family support helpful? Is support from family or friends helpful? This study seeks to answer these important questions.

This nationwide study is being conducted at the University of Hawai’i at Mānoa, and it focuses on marital distress and behavioral health issues of Army National Guard and US Army Reserve spouses. Numerous studies have researched the adverse impact military combat has on the behavioral health problems of military combat soldiers. However, little research has examined the level of post-deployment marital distress and related behavioral health issues affecting the spouses. Research is especially lacking for spouses of National Guard and Reserve soldiers.

Recruitment is underway for this study nationwide. The study is set-up as an online survey and the link to the survey is located at http://armyspousestudy.com. The participant’s identity is not collected or required and all data received is anonymous. This study will be used to inform the public and policy makers about the challenges faced by spouses of Guard and Reserve soldiers who have returned from Iraq and Afghanistan military combat deployment. Additionally, the study will inform the public and policy makers about the community and military family support service needs of this population. Furthermore, studies of spouses in all branches of the military are greatly needed as well and it is hoped that the findings of this current study will help to further research for all military spouses.

If you are a civilian spouse (or unmarried couple but living together) of an Army National Guard or Reserve soldier who has returned from OEF/OIF deployment, your participation is very important. You will have the opportunity to have your personal situation

May 6, 2011
heard and understood. By participating, you will help get information to the public about the challenges faced by Guard and Reserve spouses, which could lead to improved and/or new services to Guard and Reserve families. We anticipate that some spouses and their marriages are doing well and some are not. In order to understand the differences in these spouses and their marriages, it works best to compare and contrast the different situations, so we encourage spouses who are doing well to participate in the survey as well as those who feel they are not doing well.

Cynthia J’Anthony, MA is the principle investigator for this study. She is a doctoral candidate in clinical psychology at the University of Hawai‘i at Mānoa’s Department of Psychology.
Appendix H: Sample Flyer

ARE YOU AN ARMY NATIONAL GUARD OR ARMY RESERVE SPOUSE?

PLEASE HELP WITH THIS RESEARCH

The goal of this study is to understand what positive or negative changes may have occurred in your marital relationship since your husband returned home from deployment to Iraq or Afghanistan. Additionally, we want to understand how helpful support from family, friends, and military family support services has been for you.

This study could help improve support services and increase understanding of challenges faced by spouses of the Army National Guard and Reserve.

This is an online research study. All responses are anonymous.

Please participate, go to:

http://armyspousestudy.com

If you do not have access to the Internet and wish to participate, please contact Cynthia J’Anthony, MA at (808) 778-5755.

This is a research study conducted at the University of Hawai’i at Mānoa. Principal investigator: Cynthia J’Anthony, MA csjantho@hawaii.edu
CHS Protocol #18746
Appendix I: Online Survey

Informed Consent

BRINGING THE WAR HOME:

MARITAL DISTRESS AND DEPRESSION IN ARMY RESERVE COMPONENT SPOUSES

Thank you for considering to participate in this study.

This is a research study conducted at the University of Hawaii at Manoa by Cynthia J. Anthony, M.A., who is the principal investigator. Your participation in this study is voluntary. You should read the information below before deciding whether or not to participate.

Purpose of the study:

The purpose of this study is to:

1. Understand what positive or negative changes may have occurred, if any, in your marital relationship since your Army National Guard or US Army Reserve spouse has returned from military combat in Iraq or Afghanistan.

2. Understand to what degree you have been satisfied with support from family, friends and your military unit’s family support services.

Procedures:

This study involves using this online survey to answer some background questions about you and your spouse, to fill out some questions about your emotions, mood, and your marital relationship as well as questions about military family resources, and support from friends, and family. There are also questions at the end that ask you to share your personal thoughts.

You are encouraged to answer all the questions in order to help us more accurately understand your situation. However, your answer to each question is voluntary.

To participate in this study, you need to click on the ‘I Consent’ button (at the bottom of this page) and answer the questions presented. It is estimated that the survey will take approximately 20 to 25 minutes to complete.

Potential risks and discomforts:

There are no physical health or injury risks in taking this online survey. There may be a risk that some questions could cause discomfort if at any time you read a question that you are not comfortable answering, you do not need to answer it.

Anticipated benefits:

While there may be no direct benefits to your participation, this study may help to improve services and understand problems faced by spouses of the Army National Guard and Reserve. In addition, some people find a personal reward in participating in research that could be helpful to others in the future.

Anonymity:

All of your answers on this online survey are anonymous. Nothing in this study reveals your identity.

Participation and withdrawal:

Your participation in this research is voluntary. If you choose not to participate, it will not affect you in any way. If you decide to participate, you are free to withdraw your consent and discontinue participation at any time without prejudice.

Identification of investigators:
If you have any questions about the research, please feel free to contact Cynthia J’Anthony, M.A. at csjastho@hawaii.edu.

Rights of research subjects:

If you have questions regarding your rights as a research subject, you may contact the:

Committee on Human Studies

1950 East-West Road

Biomedical Building, Room B-104

Honolulu, HI 96822

Phone: 808-956-5007

1. Consent to Participate

☐ I Consent  ☐ I Decline

2. Do you want information on how to remove this survey from the history of your web browser?

☐ Yes
☐ No
## Information on Removing History from a Browser

The graphics cache, your browser’s back button, history file and cookies all can hold data leaving a trail of your internet activities. This data can be held in the files until they are manually cleared. If you are concerned about someone knowing you participated in this survey please follow the instructions below to remove the survey from your web browser history.

These suggestions will help keep someone with average computer skills from being able to trace your web browser history.

Before you begin, be sure to determine correctly which browser you are using. We have the instructions for Internet Explorer, Firefox, Netscape, Opera and Safari. If you are using a different type of browser you will need to consult with either an operating manual or use Google to search for instructions on deleting the history from your browser.

### MICROSOFT INTERNET EXPLORER USERS

**Note:** Users running Internet Explorer 7.0 and above need to press the Alt key in order to access the file menu & get access to options such as File, Tools, etc.

#### View History

Microsoft Internet Explorer 7 and above users: Click "Tools" menu, "Internet Options", click "Settings" button under the Browsing history, and then click "View Files". Microsoft Internet Explorer 6.x users: Click "Tools" menu, "Internet Options", click "Settings" button, and then click "View Files".

#### Deleting History

Microsoft Internet Explorer 6.x and 7.x: Click "Tools" menu, "Internet Options", and click "Delete Files" or "Delete" button.

Users also have the option of automatically deleting files each time they close the browser window by clicking the "Advanced" tab and checking "Empty Temporary Internet Files folder when browser is closed" under the "Security" section.

Microsoft Internet Explorer 4.x users on an Apple Macintosh: Click "Hard Drive" icon, "System", "Preferences", "Explorer", and move the history file into the trash.

Microsoft Internet Explorer 3.02 and lower users: Click "View", "Options", open the tab "Advanced", click the "Settings" tab, and click the "Empty Folder" button.

### MOZILLA FIREFOX USERS

#### View History

Press Ctrl + H to open the left-side history bar. or

Click History at the top of the window. or

Users using earlier versions of Mozilla Firefox can also view their history by clicking "Go" and clicking "History."

#### Delete History

Click the "Tools" menu, "Options", clicking the "Privacy" button, and under "History" click the "Clear" or "Clear Now" button. or
Press CTRL + Shift + DEL to open the Clear Data Window.

**NETSCAPE USERS**

*View History*

Open Netscape and click the “Edit” menu, “Preferences”, “History”, and view the location where Netscape is storing your files. Next, open this folder within Explorer.

*Deleting History*

Click the “Edit” menu, “Preferences”, “History”, and click the “Clear History” button.

**OPERA USERS**

*View History*

Click “Help” and then “About”. Within the “About Opera” window you’ll see the full path to where the cached files are stored. Browse to that file path to view cached files.

*Delete History*

Click the “File” menu, “Preferences”, “History”, and click “Empty now” button. In addition, users can check “Empty on exit” if they wish for this task to occur each time they exit the browser.

**SAFARI USERS**

*View History*

At the top of the screen there are menu options. Click on “History.”

*Delete History*

Choose ‘Clear History’ at the bottom of the pull down menu.
Background Questions

Instructions:
Please answer the following background questions about yourself and your spouse. If you feel the answers provided do not fit your situation exactly, then please choose the answer that is closest to your situation. If you do not feel comfortable answering a question, you do not have to answer it. However, please understand that all questions asked are important to the study and will be helpful in understanding the results of the study. Thank you for your participation.

1. Gender
   □ Male
   □ Female

2. What year were you born?

3. What is the zip code where you currently live?

4. Race/Ethnicity

   Race and Ethnicity

   If you selected an "other" race (please specify)

5. What is your level of education?

6. What is your annual household income?

7. What is your employment status? (select all that apply)

   □ Unemployed (by choice)
   □ Unemployed (looking for work)
   □ Employee Full-time
   □ Employee Part-time
   □ Self-employed Full-time
   □ Self-employed Part-time
   □ Family business Full-time
   □ Family business Part-time

   Average number of hours you work per week:

8. Please enter the year you were married (or, if not married, the year you started living together as a couple)
9. Please select the item that describes your Marital Status:

[ ] Single

[ ] Married

[ ] Divorced

[ ] Widowed
Background questions continued

1. Are you currently pregnant?
   - Yes
   - No

2. How many children live with you and are in your care?
   Number of Children

3. How old are your children who live with you?

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</table>

   Ages of additional children

4. How many step-children live with you and are in your care?
   Number of Step-children:

5. How old are your step-children who live with you?

<table>
<thead>
<tr>
<th>Youngest or Only Step Child</th>
<th>Step-Child 2</th>
<th>Step-Child 3</th>
<th>Step-Child 4</th>
<th>Step-Child 5</th>
<th>Step-Child 6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Select ages:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   Ages of additional step-children

6. Are you currently or have you ever been enlisted, appointed or inducted into military service?
   - Yes
   - No

7. Has your spouse ever served in the military?
   - Yes
   - No

8. Has your spouse been deployed to Iraq (OIF) or Afghanistan (OEF) for military combat missions?
   - Yes
   - No
Background Questions: Spouse’s Military Career

The following questions refer to your spouse’s military career. Please answer them to the best of your knowledge.

1. Please select the military branch your spouse serves (served) in:

2. Please select your spouse’s military component:

3. Is your spouse currently serving in the military?
   - Yes
   - No

4. If no:

<table>
<thead>
<tr>
<th>Month of Separation</th>
<th>Year of Separation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

5. Number of OIF/OEF Deployments

   How many times has your spouse been deployed to Iraq or Afghanistan for a military combat mission?

6. Deployment Length

<table>
<thead>
<tr>
<th>Length of OIF/OEF Deployment (Months)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

7. When did your spouse return home from the last deployment?

<table>
<thead>
<tr>
<th>Month</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

8. Please select which is currently true:

<table>
<thead>
<tr>
<th>Deployed to Iraq or Afghanistan</th>
<th>Deployed but not to Iraq or Afghanistan</th>
<th>Living at home</th>
<th>Not living at home but not deployed</th>
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9. How many years has your spouse been in the military?

10. What is your spouse’s current rank?
Background Questions: Spouse's Military Career

The following questions refer to your spouse's military career. Please answer them to the best of your knowledge.

1. Please select the military branch your spouse serves (served) in:

2. Please select your spouse's military component:

3. Is your spouse currently serving in the military?
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   - No

4. If no:

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5. Number of OIF/OEF Deployments

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<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

   How long was your spouse's most recent OIF/OEF deployment?

   How long was your spouse's longest OIF/OEF deployment?

7. When did your spouse return home from the last deployment?

<table>
<thead>
<tr>
<th>Month</th>
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<tbody>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

   My spouse is currently:

9. How many years has your spouse been in the military?

10. What is your spouse's current rank?
Counseling Hotline Information

Counseling Hotline

If your partner has thoughts of suicide, please call or have your partner the Suicide Prevention Lifeline at 1-800-273-8255 & press 1 for Veterans or you may call the Military One Source counseling line at 1-800-342-9647. They are available 24 hours a day, 7 days a week.

They will be able to offer counseling over the phone and they can help you find a local therapist whom you and/or your partner can meet with in person.

The Suicide Prevention Lifeline may also be reached online: www.suicidespreventionlifeline.org.

You may also wish to call one of the following crisis hotlines:

**Boys Town Suicide and Crisis Line: 800-448-3000 or 800-448-1833 (TDD)**

Provides short-term crisis intervention and counseling and referrals to local community resources. Counsels on parent-child conflicts, marital and family issues, suicide, pregnancy, runaway youth, physical and sexual abuse, and other issues. Operates 24 hours, seven days a week.

**Covenant House Hotline: 800-999-9999**

Crisis line for youth, teens, and families. Gives callers locally based referrals throughout the United States. Provides help for youth and parents regarding drugs, abuse, homelessness, runaway children, and massage relays. Operates 24 hours, seven days a week.
Quick Inventory of Depressive Symptomatology Self-Report

<table>
<thead>
<tr>
<th>Sleep, Appetite, Mood, &amp; Energy Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following questions refer to your sleep patterns over the past 2 weeks. Please select the answer that best describes you.</td>
</tr>
</tbody>
</table>

1. Falling asleep:
   - [ ]

2. Sleep during the night:
   - [ ]

3. Waking up too early:
   - [ ]

4. Sleeping too much:
   - [ ]

The following questions refer to your mood and appetite over the past 2 weeks. Please select the answer that best describes you.

5. Feeling sad:
   - [ ]

6. General interest:
   - [ ]

7. Appetite (in the last 2 weeks):
   - [ ]

8. Weight Change (within the last two weeks):
   - [ ]

The following questions refer to your mood and energy levels over the past 2 weeks. Please select the answer that best describes you.

9. Concentration/Decision making:
   - [ ]

10. Energy level:
    - [ ]

11. Feeling restless:
    - [ ]

12. Feeling slowed down:
    - [ ]

13. View of myself:
    - [ ]
14. Thoughts of death or suicide:
**Center for Epidemiologic Studies Depression Scale**

**Mood in the Past Week**

Please state how often you have felt this way during the past week.

**1. During the past week:**

<table>
<thead>
<tr>
<th></th>
<th>Rarely or none of the time (less than 1 day)</th>
<th>Some or a little of the time (1-2 days)</th>
<th>Occasionally or a moderate amount of time (3-4 days)</th>
<th>Most or all of the time (6-7 days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I was bothered by things that usually don’t bother me.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I did not feel like eating; my appetite was poor.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I felt that I could not shake off the blues even with help from my family or friends.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I felt I was just as good as other people.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I had trouble keeping my mind on what I was doing.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I felt depressed.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I felt that everything I did was an effort.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I felt hopeful about the future.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I thought my life had been a failure.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I felt fearful.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>My sleep was restless.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I was happy.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>People were unfriendly.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I enjoyed life.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I had crying spells.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I felt sad.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I felt that people dislike me.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I could not get “going”.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
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Counseling Hotline

If you have thoughts of suicide or of hurting yourself in any way, please call the Military One Source counseling line at 1-800-342-9647. They are available 24 hours a day, 7 days a week.

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Thank you for your participation in this survey!

If you know of an Army National Guard or Reserve spouse whose spouse has returned from OIF/OEF combat and who may be interested in participating in this study, please refer them to the survey link:

If you have any questions about this survey please contact the principle investigator, Cynthia J'Anthony, by emailing her at csjantho@hawaii.edu or call 808-778-5755.

You may also contact the University of Hawaii Committee on Human Studies if you have questions about your rights as a participant in this research study. Their contact information is:

Committee on Human Studies
1960 East-West Road
Biomedical Building, Room B-104
Honolulu, HI 96822
Phone: 808.956.5007
Email: uhirb@hawaii.edu.

If you would like to participate in a future research study, please email Cynthia J'Anthony at csjantho@hawaii.edu.

Also, if you would like to receive information on the results of the research, please email Cynthia J'Anthony at csjantho@hawaii.edu with your request. Please understand that it may take some time (possibly a year or more) to compile and analyze the data.

If you feel the need to discuss your answers to any of the questions in this survey or need someone to help you with any emotional distress, Military OneSource (militaryonesource.com) provides a 24 hour a day/7 days a week confidential call-in line which is available to military families. The number is 1-800-342-9647. They will also be able to help you connect with a local therapist.

If you need to speak with someone about domestic violence issues, the following resource may be helpful:

References


Gelin, M.N. & Zumbo, B.D. (2003). Differential item functioning results may change depending on how an item is scored: An illustration with the Center for Epidemiologic Studies


Trivedi, M., Rush, A., Ibrahim, H., Carmody, T., Biggs, M., Suppes, T., …, & Kashner, T.M.. (2004). The Inventory of Depressive Symptomatology, Clinician Rating (IDS-C) and Self-Report (IDS-SR), and the Quick Inventory of Depressive Symptomatology, Clinician Rating (QIDS-C) and Self-Report (QIDS-SR) in public sector patients with mood disorders: a psychometric evaluation [Electronic version]. Psychological Medicine, 34, 73–82.

