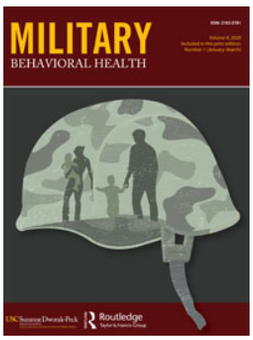

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Preliminary Psychometrics and Potential Big Data Uses of the U.S. Army Family Global Assessment Tool

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ABSTRACT

The purpose of the present study is to explore the psychometric properties of the U.S. Army's Family Global Assessment Tool (GAT), which assesses the psychosocial fitness of Army families. With data from 1,692 Army spouses, we examined the structure, reliability and validity of the GAT, using confirmatory factor analysis (CFA) and two validity studies. Fifty-three items and 9 factors were retained following CFA. This model provided a good fit, and scales demonstrated strong internal consistency. Bivariate correlations and results from a theoretically driven model provide preliminary evidence of validity. Findings support the usefulness of the GAT for measuring psychosocial fitness of Army spouses.

KEYWORDS

Family; Marriage Relations/ Divorce/Remarriage; Parenthood/Parent-Adult Child Relations; Army; Spouses; Resilience; Psychometrics

The U.S. Army's Comprehensive Soldier and Family Fitness (CSF2) program was created in response to mounting evidence suggesting that U.S. involvement in two protracted overseas conflicts was taking a toll on the psychological health of soldiers and their families. This program was tasked with evaluating the physical, social, emotional, family and spiritual health of Army families and implementing universal prevention efforts to bolster soldier and family resilience (Peterson, Park, & Castro, 2011). Critical to this effort was a valid and reliable instrument that could efficiently measure these domains as both a means to guide intervention selection and to measure the effectiveness of prevention strategies (Cornum, Matthews, & Seligman, 2011). Drawing when possible on previously validated measures, the Soldier and Family Global Assessment Tools (GATs) were created by an expert committee, with input from the military, academia and the private sector, to meet this need (Peterson et al., 2011). The Soldier GAT has recently undergone psychometric validation; the results of this effort support the ongoing use of the Soldier GAT as an assessment tool (Vie, Scheier, Lester, & Seligman, 2016). This effort is a secondary analysis of Family GAT data by authors uninvolved with the original development of the instrument. The purpose of the current study is to 1) explore the underlying structure of the Family GAT; 2) examine the usefulness of individual items in the instrument; and 3) to establish preliminary evidence of reliability and validity, which can be built on in future research.

Theoretical foundations of the family GAT

The Soldier and Family Global Assessment Tools are grounded in positive psychology, which seeks to identify and promote characteristics that enable individuals and communities to thrive (Seligman & Csikszentmihalyi, 2000). As such, these instruments assess positive emotions, personal attributes, and resilient functioning, which contribute to a "full life" (Peterson, Park, & Seligman, 2005). On the Family GAT, these positive attributes include character strengths, optimism, positive coping, and healthy family and relationship functioning. Additionally, several scales measure aspects of negative explanatory style, which has its roots in learned helplessness theory (Abramson, Seligman, & Teasdale, 1978). On the Family GAT, these include attributes such as depression, catastrophic thinking, and loneliness.

The Family GAT survey was designed as a self-development tool and was not initially intended for

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research purposes (Lester, McBride, & Cornum, 2013). As such, there is little existing information regarding the validity, reliability, and underlying structure of this instrument, which limits its usefulness for research or program evaluation. However, because collecting original data from military families presents logistical and ethical challenges (Castro & Sullivan, 2018), the richness of the information we have about this population lags far behind the generation of new knowledge about soldiers (Park, 2011). Thus, efforts to evaluate the psychometric properties of the Family GAT are critical. Once validated, this survey offers a unique new avenue through which to explore the functioning of military family systems, particularly during this period of increased operational tempo when evidence suggests that some military families may be struggling (Card et al., 2011; Lester & Flake, 2013).

Big data uses for the family GAT

A particularly useful aspect of the GAT surveys is the capacity to connect these measures of resilience and psychosocial functioning with objective information regarding soldiers' service that is gathered by the Department of Defense (DoD). These data are stored and accessible in the Army's Person-Event Data Environment (PDE), which is a cloud-based, virtual environment that facilitates data access and linkage across the Army and DoD (Vie, Griffith, Scheier, Lester, & Seligman, 2013; Vie et al., 2015). The term "big data" has been used to describe the "collection and integration of datasets from multiple disparate sources, covering various unique topics, to provide a more rich and robust picture of individuals, groups, and systems" (Hawkins et al., 2017, p. 2). Using the PDE, Family GAT information can be linked to over 350 manpower, service, personnel, financial, behavioral health, and medical datasets, which can provide objective information regarding exposure to risk factors including family separations, reunifications, and relocations.

The focus of the present study is to explore the underlying structure of the Family GAT and establish preliminary reliability and validity. Ultimately, the goal is to provide evidence of acceptable psychometric properties such that Family GAT survey data can be reliably included in big data efforts using the Army's PDE. Future studies involving these linked datasets have the potential to provide a rich, nuanced picture of military families and substantially improve the quality and specificity of research conducted with this population.

Methods

Participants and procedures

The Family GAT is completed on a voluntary basis by Army spouses, who access the survey by visiting a hosting website. The Family GAT is extensively publicized as a component of the Army's Ready and Resilient Campaign. Spouses learn about the survey through Army publicity as well as through their spouse or family readiness group. At the conclusion of the survey, spouses are given feedback about their responses and links to online learning modules to address identified challenges. Upon completion of the Family GAT, respondents have the option to give consent for their de-identified data to be used for research. Only data from spouses who provided consent are used in these analyses. Secondary analyses of GAT data were approved by the Army Research, Development and Engineering Center (ARDEC) IRB as well as the IRB at the University of Southern California.

Sample

To be included in the current sample, participants had to take the Family GAT between October 2013, when respondents could opt in to research, and December 31, 2016. While spouses can take the Family GAT as many times as they choose, only first GAT completions were used in the current analyses, which resulted in a total of 2,777 unique Family GAT participants, approximately 1% of the population of Army spouses. Additionally, to be able to link survey responses to DoD administrative and health data, only spouses who could be associated with an Army sponsor were included in the dataset. This resulted in a loss of 216 participants for a total of 2,561. Family GAT takers who had their own sponsor ID number and could be linked to a spouse with a sponsor ID were determined to be in a dual military relationship, where both spouses are military service members. These 238 participants were retained in the dataset. Finally, Family GAT takers who had their own sponsor ID number but could not be linked to a spouse with a sponsor ID were determined to be service members who took the Family GAT in addition to the Soldier GAT. As we could not be certain whether these respondents had families or potentially took the Family survey in error, these observations were also

eliminated from the dataset, resulting in a final analytical sample of 1,692 Army spouses.

Sample description

Sample demographics are presented in Table 1. Demographic information was obtained from Department of Defense personnel data, which was linked to Family GAT data using soldiers' unique identification numbers. Not all Family GAT takers could be linked with personnel records so there is some missing demographic data. In this sample, the overwhelming majority of Family GAT takers were females who were 35 years old on average. These data do not contain information on the race/ethnicity of spouses, but 64% of soldiers in these families are White, 11% are Black and 10% are Hispanic. About 20% of these families reported having no children, 17% had one child, 25% had two children, 16% had 3, and 9% had 4 or more.

Table 1. Sample demographics.

	N (%)	Mean (SD)
Service member demographics		
Service member age		36.54 (8.28)
Service member sex		
Male	1415 (83.6)	
Female	106 (6.3)	
Service member education		
Completed high school or below	495 (29.3)	
Completed some college or above	993 (58.7)	
Service member rank		
Enlisted	860 (50.8)	
Officer	661 (39.1)	
Service member race/ethnicity		
White	1086 (64.2)	
Black	182 (10.8)	
Asian	44 (2.6)	
American Indian/Alaskan Native	8 (0.5)	
Hawaiian/Pacific Islander	12 (0.7)	
Hispanic	160 (9.5)	
Family demographics		
Spouse age		35.46 (8.50)
Spouse sex		
Male	74 (4.4)	
Female	1382 (81.7)	
Number of children in the home		
0	360 (21.3)	
1	289 (17.1)	
2	417 (24.6)	
3	262 (15.5)	
4 or more	156 (9.2)	

Family GAT measures

The Family GAT survey includes 16 a priori scales, many of which were drawn from or based on previously validated measures, though items have been dropped or wording changed from the original measures. The scales in their current form have not undergone examination of their structure and psychometric properties. Presented below are the 16 scales, sample items, and information concerning the origin of the items for those that were based on previous scales. All scales were coded such that higher scores represent positive functioning.

Character strengths

This scale includes 18 out of 240 items from the Values in Action Inventory of Strengths (Peterson & Seligman, 2004). The scale asks participants to consider how often they have showed or used the listed qualities in the preceding 4 weeks on a 10-point Likert scale from *Never* to *Always*. Items include: "Creativity – coming up with new ideas" and "self-control or self-regulation."

Depression

This scale includes 5 items that were based on the Patient Health Questionnaire (PHQ) – 9 (Kroenke, Spitzer, & Williams, 2001), beginning with the prompt "In the past four weeks, how often have you been bothered by any of the following problems?" Item responses are on a 5-point Likert scale from *Not at all* to *Every day*. Sample items include: "feeling tired or having little energy" and "little interest or pleasure in doing things."

Positive and negative affect

This scale includes 5 items drawn from the Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988). The scale presents "a number of words that describe different feelings" and asks participants to rate how often they have felt these emotions over the past four weeks on a 5-point Likert scale from *Never* to *Most of the Time*. Items include: "joyful/happy," "sad," and "peaceful/calm."

Problem-focused coping

This scale includes 3 items adapted from the Brief COPE (Carver, 1997; Carver, Scheier, & Weintraub, 1989) and asks participants how well the presented statements describe them on a 5-point Likert scale from *Not like me at all* to *Very much like me*. Sample items include: "For things I cannot change, I accept them and move on" and "When bad things happen, I try to see the positive sides."

Catastrophic thinking

This scale includes 3 items from the Attributional Styles Questionnaire (Peterson et al., 1982). The prompt also asks participants how well the presented statements describe them on a 5-point Likert scale from *Not like me at all* to *Very much like me*. Items

include: "When bad things happen to me, I expect more bad things to happen" and "I have no control over things that happen to me."

Optimism

This scale includes 3 items adapted from the Revised Life Orientation Test (Scheier & Carver, 1985; Scheier, Carver, & Bridges, 1994). The prompt and response scale are the same as above. Sample items include: "Overall, I expect more good things to happen to me than bad" and "I am always optimistic about my future."

Problem management

This scale includes 4 items that ask participants to rate themselves in terms of "handling the following areas" of their lives on a 5-point Likert scale from *Poor* to *Excellent* with an option to select *Not Applicable*. Sample items include: "Handling parenting tasks and discipline of my children" and "Managing household and chores."

Loneliness

This scale includes 3 items adapted from the UCLA Loneliness Scale (Russell, Peplau, & Ferguson, 1978). The prompt asks participants to be "as honest as possible" and response options are on a 5-point Likert scale from *Never* to *Most of the time*. Sample items include: "How often do you feel left out?" and "How often do you feel part of a group?"

Social support

This scale includes 5 items that ask participants to rate "how well these statements describe you and your life?" Response options are on a 5-point Likert scale from *Strongly disagree* to *Strongly agree*. Items assessed instrumental and emotional support, for example: "If I was sick, I could easily find someone to help me with my daily chores" (instrumental support) and "There is someone I can turn to for advice on how to deal with a personal or family problem" (emotional support).

Social connections

This scale includes 5 items and asks participants to "think about your relationship with people in your community and neighborhood (other than family members)." Participants rate how often they have experienced each item in the past four weeks on a 5-point Likert scale from *Never* to *Most of the time*. Sample items include: "I participated in community events, activities or meetings" and "I felt close to others in my community."

Family satisfaction

This scale consists of two items assessing how participants have felt about their relationship or family over the past four weeks. Response options are on a 5-point Likert scale from *Not at all satisfied* to *Extremely satisfied* with a *Not Applicable* option. The items are: "How satisfied are you with your marriage/relationship?" and "How satisfied are you with your family?"

Relationship functioning

This scale consists of 8 items that ask participants to describe their feelings about their partner and their relationship. Response options are on a 5-point scale from *Strongly disagree* to *Strongly agree*. Sample items include: "My partner is emotionally supportive of me" and "My partner and I clearly communicate our expectations for each other."

Child functioning

This scale consists of 5 items that begin with the prompt: "If you have children, how have they been doing during the past four weeks?" Response options range from *Poor* to *Excellent* with a *Not applicable* option. Sample items query how children are doing "socially," "psychologically" and "at home."

Support for military

Two items ask participants to respond regarding how strongly they agree or disagree with the presented statements. Response options are on a 5-point Likert scale with a *Not applicable* option. Items include: "I support my partner's decision to serve in the military" and "The military meets my family's needs."

Family cohesion

Three items based on the McMaster Family Assessment Device (Epstein, Baldwin, & Bishop, 1983) assess family functioning. The items ask participants to describe their "family as a whole" and offer response options on a 5-point Likert scale from *Strongly disagree* to *Strongly agree*. Sample items include: "My family expresses tenderness" and "My family confides in each other."

Meaning

This scale includes 5 items adapted from the Brief Multidimensional Measure of Religiousness/Spirituality (Fetzer Institute, 2003). The prompt asks participants to rate how well the statements describe "how you actually live your life." Response options are on a 5-point Likert scale from *Not like me at all*

to *Very much like me*. Sample items include: "I have a purpose in life" and "I believe the things that I do are worthwhile."

Analytic plan

Considering that the Family GAT survey was grounded in theory and scales were drawn from previously validated measures or designed to measure specific constructs, we undertook a two-step confirmatory factor analysis (CFA) approach to examine the underlying structure of the Family GAT (Thompson, 2004). In step one, we ran an initial CFA model on one randomly generated half of the dataset, using all items from the original Family GAT survey to define the constructs as intended by the original survey developers. We explored modifications to this initial model to improve the fit and face validity of resulting scales and, in step two, tested the final model again on the hold-out sample. To establish preliminary reliability, the internal consistency of the resulting scales was examined. As this was a secondary analysis of previously collected data, we were unable to pursue traditional strategies to establish validity of survey scales. Instead, we conducted two validity studies using the pattern of bivariate correlations and simple regression to explore the GAT scales consistency with theory and previous empirical evidence. All analyses were conducted within the Army's Person-Event Data Environment using SPSS Version 21 and MPlus Version 7 (Muthén & Muthén, 2012).

Results

Family GAT structure

To conduct confirmatory factor analyses, data were randomly split into two halves (N = 831 and N = 861, respectively). Using the first randomly generated subsample of 831 spouses, an initial CFA model was run, specifying *a priori* factors using all items from the Family GAT survey to define constructs as intended by the original survey developers. A well-fitting model was expected to have a root mean square error of approximation (RMSEA) less than 0.05, Comparative Fit Index (CFI) greater than 0.95, and Standardized Root Mean Square Residual (SRMR) less than 0.08 (Hu & Bentler, 1999). The Maximum Likelihood estimator was used and missing data were handled using Full Information Maximum Likelihood available in MPlus. The fit of this initial model did not exceed expectations for a well-fitting model (RMSEA = 0.038 (90% CI: 0.37, 0.040; CFI = 0.90; SRMR = 0.05).

In order to achieve acceptable fit, we took a conservative approach to inclusion of items and scales, employing a five-step process to improve fit and arrive at our final model. In step 1, five items which referred to the functioning of children were dropped because of missingness that ranged from 444 to 641 missing data points, reflecting that many spouses in this sample are not parents. In step 2, we eliminated scales that were only measured by two items (Marsh, Hau, Balla, & Grayson, 1998). This included the *family satisfaction* scale and the *support for the military* scale, both of which were comprised of items developed solely for this survey.

In step 3, we eliminated scales in which a majority of items cross-loaded in a complicated pattern on multiple other factors in the model. Cross-loadings ranged from 0.125 - 0.386 in this group of items. Considering the large sample size, these cross-loadings, even when small, were nevertheless significant and had an adverse impact on overall fit when fixed at zero. Four scales were dropped at this stage, three of which were based on previously validated measures. First, within the positive and negative affect scale, the *sad* item also loaded onto the depression factor (0.364), the *hopeful* item also loaded onto the optimism factor (0.125), and the *joyful/happy* item also loaded onto the catastrophic thinking factor (0.260). Second, within the catastrophic thinking scale, all 3 items ("*when bad things happen, I expect more bad things*"; "*I have no control over the things that happen to me*"; and "*I respond to stress by making things worse*") also loaded onto the optimism factor (cross-loadings: 0.127, 0.258, and 0.125, respectively). Third, within the *loneliness* scale, 2 items ("*how often do you feel close to people*" and "*how often do you feel part of a group*") both loaded onto the social connections (cross-loadings: 0.157 and 0.173, respectively) and social support (cross-loadings: 0.209 and 0.147, respectively) factors. Finally, within the *problem management* scale, which was developed for this survey, 1 item, which referred to the execution of parenting tasks, was dropped in step 1. The remaining 3 items on this scale ("*managing stress effectively*"; "*managing household chores*"; and "*managing the unexpected*") also loaded onto other factors including *catastrophic thinking, coping,* and *depression* (cross-loadings ranged between 0.202 and 0.386).

In step 4, we examined individual items that cross-loaded in a complicated pattern on multiple other factors. In this group, cross loadings ranged from 0.177 to 0.375. In order to achieve good conceptual separation between factors as well as overall model fit and data reduction, these items were also dropped. Ultimately, this group included one item from the

original depression scale ("*feeling bad about yourself, or that you are a failure, or have let yourself or your family down*"), which also loaded onto the family cohesion (0.177), social support (0.187), coping (0.351) and optimism (0.203) factors and one item from the relationship functioning scale ("*I wish I had not gotten into this relationship*"), which also loaded onto the loneliness (0.238), depression (0.197), family satisfaction (0.375), family cohesion (0.192) and social support (0.270) factors.

In step 5, we consulted modification indices to improve overall model fit. These indices suggested fit would improve by freeing a number of parameters to account for the correlation between the unique portion of pairs of items. These included, for example, two depression indicators ("*feeling tired and having little energy*" with "*poor appetite or overeating*"), two meaning-making indicators ("*my life has meaning*" and "*I believe the things I do are worthwhile*"), and two family cohesion indicators ("*my family confides in each other*" and "*when my family makes important decisions, we all share our opinions*"). In all cases, these decisions were evaluated to ensure that items were conceptually similar in order to justify freeing these parameters.

From the original 16 scales, the final model includes 9 factors: social connections, depression, family cohesion, social support, relationship functioning, coping, optimism, meaning-making and character. Fit statistics include: CFI = .951, RMSEA = .030 (90% CI: .028, .032), and SRMR = 0.039. The final model was also tested in the hold out sample (N = 861), and had identical fit. Fit statistics of the model in the hold-out sample were: CFI = .951, RMSEA = .030 (90% CI: .028, .032), and SRMR = 0.039. The final model including all indicators and factor loadings is presented in Table 2.

Reliability

While we were unable to establish test-retest reliability as these analyses were conducted after data had already been collected, internal consistency was established by calculating Cronbach's alphas for final scales. All α scores are presented in Table 2. These values range from 0.74 for the character scale to 0.91 for the relationship functioning scale, suggesting that the internal consistency for all retained scales was acceptable (Tavakol & Dennick, 2011).

Validity

As this was a secondary analysis of previously collected data, we were not able to use traditional methods of establishing validity through comparison to previously validated scales. Instead, we undertook two studies to establish preliminary validity of final scales. Before proceeding with the first of these studies, composite scores were created for each factor based on the mean of the items which loaded onto that factor. Means and standard deviations for these summary variables are displayed in Table 2. While all items were recoded such that higher numbers represent positive functioning, for the purposes of establishing validity and ease of interpretation, we used a version of the depressive symptoms variable that was not reverse scored, such that higher scores indicated higher levels of depressive symptoms.

Validity study one

In Study One, we followed the approach taken by the Soldier GAT validation team (Vie et al., 2016). Using this method, preliminary convergent and discriminant validity were established by examining the pattern of bivariate correlations between scales and comparing this pattern to expected relationships. To establish preliminary discriminant validity, we expected all 8 positive functioning scales to be significantly inversely related to depressive symptoms scores. To establish preliminary convergent validity, we expected all 8 positive functioning scales to be significantly positively related to each other. Further, literature suggests a relationship between social connections and social support (Heaney & Israel, 2008), between relationship functioning and family functioning (Katz & Woodin, 2002), and between the inter-related constructs of meaning-making, optimism, and positive coping skills (Folkman & Moskowitz, 2000). Thus, we expected that the magnitude of these correlations would be higher than other significant relationships.

Bivariate correlations are displayed in Table 3. As expected, depressive symptom scores were significantly negatively correlated with 7 out of 8 positive functioning variables. Correlations ranged between $r = -0.32$ ($p < 0.01$) for the relationship with family functioning to $r = -0.46$ ($p < 0.01$) for the relationship with coping. In contrast, the character scale was weakly but significantly positively correlated with depression ($r = 0.18$, $p < 0.01$), contrary to our expectations. Further, 7 out of 8 positive functioning scores were significantly positively associated, while the character scale was significantly negatively associated with the other 7 positive functioning scales, contrary to our expectations. Finally, we examined several specific relationships that we expected to be stronger, based on previous findings. As expected, the strongest

Table 2. Final factors and items.

Factor	CFA Loading	Scale Mean	Scale SD	Scale Alpha
Relationship Functioning		4.00	0.87	0.91
Our relationship has serious problems.*	.83			
My partner is emotionally supportive of me.	.78			
I feel emotionally distant from my partner.*	.85			
My partner and I clearly communicate our expectations …	.78			
My partner does not understand me.*	.84			
My partner and I have a trusting relationship	.69			
My partner and I get on each other's nerves.*	.61			
Positive Coping		3.64	0.89	0.75
For things I cannot change, I accept them and move on.	.61			
When bad things happen, I try to see the positive sides.	.67			
When something stresses me out, I have effective ways to deal.	.74			
Depressive Symptoms		3.88	0.92	0.86
Feeling tired or having little energy*	.73			
Poor appetite or overeating*	.71			
Trouble concentrating on things*	.79			
Little interest or pleasure in doing things*	.83			
Social Support		3.86	0.90	0.86
I have as much contact with friends and family as I want or need.	.68			
If I was sick, I could find someone to help me with my daily chores.	.78			
There is someone I can turn to for advice on personal/family probs.	.74			
If I wanted to have lunch, I could find someone to join me.	.75			
If I was stranded 10 miles from home, there is someone I could call.	.73			
Social Connections		3.19	1.10	0.91
I participated in community events, activities or meetings	.78			
I felt like I could make a difference in the community.	.75			
I helped out others in my neighborhood.	.84			
I felt close to others in my community.	.90			
I had a good relationship with people in my neighborhood.	.79			
Meaning		4.07	0.81	0.85
My life has meaning.	.92			
I believe my life is closely connected to all humanity.	.60			
The job my partner is doing in the military has enduring meaning.	.52			
I believe the things that I do are all worthwhile.	.89			
I have a purpose in life.	.89			
Family Cohesion		4.16	0.74	0.86
My family expresses tenderness	.83			
My family confides in each other.	.85			
When my family makes decisions, we all share our opinions.	.76			
Optimism		3.74	0.96	0.87
In uncertain times, I usually expect the best.	.82			
Overall, I expect more good things to happen to me than bad.	.82			
I am always optimistic about my future	.90			
Character		3.28	0.89	0.74
Creativity – coming up with new ideas	.36			
Curiosity or interest	.33			
Critical thinking, open-mindedness, or good judgement	.39			
Love of learning, learning something new	.39			
Perspective or wisdom	.42			
Bravery or courage	.22			
Honesty	.34			
Zest, enthusiasm or energy	.37			
Kindness or generosity to others	.34			
Teamwork	.35			
Fairness	.43			
Leadership	.36			
Forgiveness or mercy	.45			
Modesty or humility	.44			
Prudence or caution	.39			
Self-control or self-regulation	.38			
Gratitude or thankfulness	.42			
Playfulness or humor	.29			

*Item reverse coded such that higher scores reflect more positive functioning.

relationships were between social connections and social support ($r = 0$ .55, $p < 0.01$), between relationship functioning and family cohesion ($r = 0.52$, $p < 0.01$), between meaning-making and positive coping ($r = 0.55$, $p < 0.01$), between meaning-making and optimism ($r = 0.61$, $p < 0.01$), and between positive coping and optimism ($r = 0.68$, $p < 0.01$). The magnitude of these correlations suggests that these

Table 3. Bivariate correlations between composite scores.

	1	2	3	4	5	6	7	8	9
1. Depressive Symptoms	1.000								
2. Social Connections	−0.382	1.000							
3. Social Support	−0.458	0.552	1.000						
4. Relationship Functioning	−0.391	0.301	0.444	1.000					
5. Family Cohesion	−0.320	0.360	0.430	0.524	1.000				
6. Meaning-making	−0.432	0.506	0.513	0.417	0.468	1.000			
7. Positive Coping	−0.461	0.411	0.453	0.365	0.367	0.551	1.000		
8. Character	0.179	−0.215	−0.176	−0.154	−0.169	−0.248	−0.239	1.000	
9. Optimism	−0.431	0.434	0.503	0.360	0.410	0.613	0.680	−0.210	1.000

Note: All correlations significant at the 0.01 level.

Table 4. Simple theoretically-driven regression model predicting depression (where higher scores indicate greater depression severity).

	Model 1			Model 2		
Variable	*B*	*SE B*	*β*	*B*	*SE B*	*β*
Family Functioning	−.188**	0.030	−0.150	−0.159	0.030	−0.128
Social Support	−.405**	0.024	−0.394	−0.395	0.024	−0.385
Family Functioning x Social Support				0.110	0.026	0.093
R^2	0.229			0.236		
F for change in R^2	250.116**			17.378**		

** $p < 0.001$.

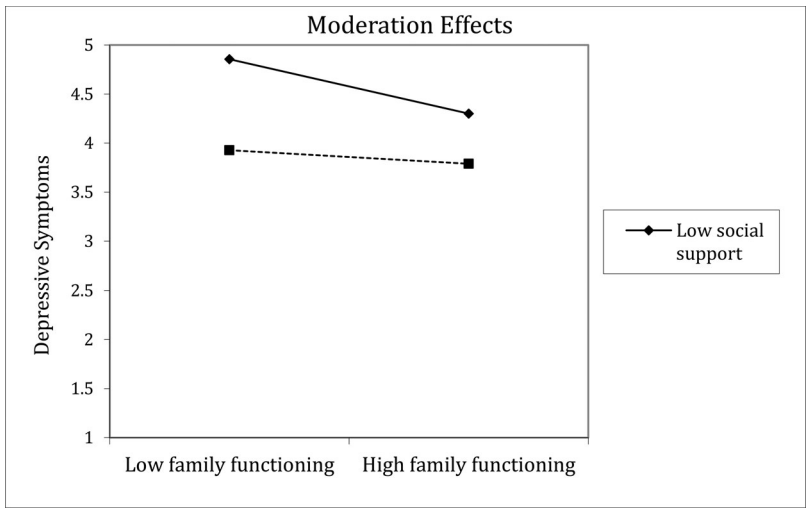

Figure 1. Moderation effects.

constructs are similar, as expected, but nevertheless conceptually distinct. The character scale will be discussed further below.

Validity study two

In Study Two, several scales were selected to test a simple, theoretically-driven model. Family stress theory suggests that stressors, like poor family cohesion, will be moderated by the resources (including social support) that families mobilize, which will determine whether families cope successfully or experience adverse outcomes, including depression (Boss, 2002). As a measure of the theoretical consistency of the Family GAT scales, we used multiple linear regression to test the relationship between family cohesion and spouse depressive symptoms, moderated by social support.

Hierarchical multivariate regression results are presented in Table 4. To avoid issues of multicollinearity, mean centering was used when creating the interaction term. Model 1, including main effects of family functioning and social support, was significant (F [2, 1688] = 250.12, $p < 0.001$) and explained 22.9% of the variance in our outcome, depression ($R^2 = 0.229$). Model 2 (main effects and the interaction between family functioning and social support) had better fit ($\Delta F = 17.57$, $p < .001$) and explained significantly more variance in our outcome ($R^2 = 0.237$). In this model, family functioning ($\beta = -0.127$, $p < 0.001$), social support ($\beta = -.384$, $p < 0.001$), and their

interaction ($\beta = 0.094$, $p < 0.001$) were significantly associated with our outcome, indicating that social support moderated the relationship between family functioning and depressive symptoms. This interaction is depicted in Figure 1, which suggests that at lower levels of social support, less family cohesion is more strongly associated with depressive symptoms. These theoretically consistent findings provide further evidence of the validity of Family GAT scales.

Discussion

Findings from this study provide preliminary evidence to support the reliability, validity and multidimensional factor structure of the Family GAT. Following confirmatory factor analysis, 53 items, which loaded onto 9 factors, were retained. These factors represent key facets of military family functioning, including social support and connectedness, coping, optimism, and meaning-making, spouse mental health, and strong, cohesive marital and family relationships. In addition to the factor structure, preliminary evidence regarding the reliability and validity of the Family GAT is encouraging. The majority of the remaining scales demonstrated good internal consistency. Further, initial efforts at establishing validity suggest that the majority of Family GAT scales perform as expected based on theory and previous empirical evidence.

Findings presented here provide support for the use of these scales in empirical research. These items measure critical elements of the psychosocial functioning of military families and, in particular, speak to protective family processes that may counteract risks to which military families are exposed. Linking this information with Department of Defense operational and manpower data has the potential to provide a more complete picture of the wellbeing of military families. In addition to its usefulness for research purposes, these results also support the ongoing use of the Family GAT as a self-evaluation and development tool, as it was originally intended. Preliminary reliability and validity, presented here, suggests that these scales are accurately and consistently measuring elements of family functioning that will provide useful information in real time to Army families.

While 9 scales emerged from the confirmatory factor analysis process, several scales and items on the Family GAT did not exceed the threshold for scientific rigor and were not retained for the purposes of ongoing military families research. Among these are items assessing positive and negative affect, loneliness, catastrophic thinking, and support for the military. While the character scale did exceed the criteria set during the CFA phase of analyses, it did not perform as well when examining its reliability and validity. This scale had the lowest internal reliability of any scale following CFA ($\alpha = 0.74$) and it did not perform as expected when examining bivariate correlations with other positive functioning scales. As this scale is intended to assess strengths (Peterson & Seligman, 2004), we expected it to be positively related to other measures of healthy functioning, like optimism or coping. However, in this sample, the character scale was weakly and negatively correlated with the other 7 positive functioning scales and weakly but positively correlated with the depression scale. These findings call into question the utility of the character scale for research purposes. While all of the eliminated scales are limited in their scientific usefulness, these items nevertheless represent important constructs and may continue to contribute to the self-evaluation and development goals of overarching Army programs.

Previous research suggests that the retained scales from the Family GAT measure critical aspects of healthy functioning among military families. For example, social support and social connections have been found to positively impact military family adaptation (Bowen, Mancini, Martin, Ware, & Nelson, 2003). Further, military parents' perception of the social support their families receive has also been associated with positive child psychosocial functioning (Flake, Davis, Johnson, & Middleton, 2009). Positive coping has been linked with healthier family functioning and successful management of military separations specifically (Weins & Boss, 2006). Optimism and meaning-making have been hypothesized as crucial factors in adaptation to stressors among military families and children. These elements are critical components of the Families OverComing Under Stress (FOCUS) intervention, a resilience training program for military families experiencing stressors like deployments (Saltzman et al., 2011).

Extant literature also suggests that aspects of spouse functioning and family relationships that are measured by the Family GAT are integral to understanding how military families are faring in the current operational climate. These associations may not be unidirectional, but rather may tap into the complex patterns of relationships that reverberate through family systems. For example, we know that spouse mental health may be adversely impacted by exposure to their partners' combat deployments and the potential consequences of these deployments (de Burgh, White,

Fear, & Iversen, 2011). However, research has also demonstrated the critical role that spouse mental health plays for the well-being of military-connected youth and family functioning (Green, Nurius, & Lester, 2013). Similarly, deployment may increase risk for unhealthy marital relationships (de Burgh et al., 2011), which may in turn impact outcomes for children and family functioning (Paley, Lester, & Mogil, 2013). Riggs and Riggs (2011) theorized that a healthy marital relationship contributes to a secure attachment system for the military spouse which has a cascade of positive effects for family functioning and child well-being. Further, they suggest that family cohesion and healthy but permeable family boundaries help families to cope with the deployment cycle (Riggs & Riggs, 2011). Evidence suggests that family cohesion may also be associated with the psychosocial adjustment of military-connected youth (Finkel, Kelley, & Ashby, 2003).

Limitations

Though the research cited above suggests that the scales on the Family GAT survey may provide information regarding important elements of military family functioning, there are nevertheless several limitations which should be noted. As the analyses presented here were conducted on data that was previously collected, many of these limitations result from the challenges inherent in secondary data analysis. In particular, some aspects of traditional psychometric validation were not possible as these data were not available. We were unable to evaluate the test-retest reliability of the Family GAT as data were not collected at two consistent time points in order to evaluate the uniformity of responses across time. Further, these analyses did not incorporate previously validated measures as a means to examine the convergent or discriminant validity of Family GAT scales. Future research which explores the relationship between the dimensions presented here and previously validated measures of wellbeing would strengthen evidence of validity. Additionally, the Family GAT survey is a self-report measure and all analyses were conducted using cross-sectional data. Use of multiple informants and longitudinal data would strengthen validity evidence.

The Family GAT is completed on a voluntary basis and to date a small proportion of Army spouses (approximately 1%) are represented in the dataset, which may introduce bias. Though the demographic profile of GAT completers is relatively similar to the Army overall, Army spouses who chose to complete this survey and consented to the use of their data for research purposes may be different in important ways from the larger group of spouses who have yet to participate. Care should be taken when generalizing results from this sample and particularly when drawing conclusions that may have policy or practice implications. Finally, we did not have the sample size to examine measurement invariance across relevant demographic categories including gender, race/ethnicity, or Soldiers' military rank. The Family GAT sample size is expected to increase as Army spouses continue to take the survey, which may make examining measurement invariance possible in the future. Taken together, these limitations suggest that results from this study should be considered preliminary.

Future directions

The overarching goal of these initial analyses was to explore underlying structure and provide preliminary evidence of acceptable psychometric properties such that Family GAT scales could be used alongside DoD archival datasets to provide further evidence of validity and begin to offer a more complete and contextualized picture of military family functioning. While these efforts are subject to the limitations described above, the true strength of the Family GAT data resides in the opportunity this instrument offers to combine psychosocial indicators with objective information about military-related stressors. Most of the scales in the Family GAT measure spouse and family strengths and may offer insight into protective factors that have the potential to counteract the risks to healthy family functioning that are inherent in military life (Burrell, Durand, & Fortado, 2003). Meanwhile, the archival data available in the PDE provide a wealth of information about actual risk factors that families have experienced, including their deployment history and their experiences of relocation. Further, access to soldier and dependent health records provides concrete health and mental health outcomes for this population, increasing the public health relevance of these efforts.

Integrating these disparate sources of information using big data methods offers many opportunities for future research. Ongoing efforts to explore the validity of the Family GAT could be enhanced by examining whether GAT scales can predict health and mental health outcomes with a reasonable level of accuracy. Further, combining protective factors from the Family GAT with information about risk factors like

deployment history may help us to understand why some military families appear to struggle with the stressors they experience while the majority seem able to cope relatively successfully. Additionally, identifying variables that mediate or moderate the relationships that we have seen demonstrated in the literature, particularly between deployment experience and adverse individual and family outcomes, may shed further light on meaningful targets for intervention with this population.

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