Abstract

Subjective wellbeing is a positive psychological construct that has important implications for the U.S. Military's goal to develop Service Members' strengths and support their overall thriving and downstream resilience. Despite this, the concept of wellbeing has not been well studied in military populations who have unique work demands, stressors, and autonomy/agency in daily life compared to civilians. To address this shortcoming in the literature, the present study assessed Ryff's measures of psychological wellbeing (PWB) in 1,333 U.S. Service Members prior to deployments in the middle east. Various methods attempting to validate the theoretical model purported by Ryff, were unsuccessful and exploratory factor analyses did not result in a novel model for this population. Future research should continue to evaluate proposed models of Soldier wellbeing and propose novel theories, as well as measures, to assess this important construct. Implications are discussed.

Keywords: confirmatory factor analysis; culture; exploratory factor analysis; organization; Service Members

Public Significance Statement: The current manuscript employed several modeling techniques in an attempt to validate an enduring model of wellbeing used in the psychological literature. Findings suggest that the purported Psychological Wellbeing Model is not accurately defined by the measure items in a military sample. This is a critically important finding as this measure is used throughout the scientific literature and specifically in military populations to evaluate wellness programs and policies.

Introduction

Much like the wider field of psychology (Seligman & Csikszentmihalyi, 2014), military mental health also has epistemological roots in human pathology (Matthews, 2008). Although the precipitants and reinforcers of mental illness are critical topics to address, a pathology-exclusive perspective on wellbeing fails to identify and leverage the protective factors that facilitate 'thriving.' A rebound effect from the traditional pre-occupation with reducing the occurrence – and ameliorating the symptoms – of stress disorders in military personnel was recognized in the early 2000's as the 'positive psychology movement,' which made human strengths and capacities an important emphasis for the United States Military (Sheldon & King, 2001). Such a change in focus is exemplified by programs such as Comprehensive Soldier Fitness (CSF), an assessment-driven intervention addressing a range of strength-based fitness areas (e.g., emotional, social, spiritual) aimed at improving overall soldier functioning (Cornum et al., 2011). This program, and others like it, forwards the importance of positive psychology constructs like resilience, which are believed to buffer individuals from psychological pathology and other forms of maladaptive cognition and behavior, thereby providing a springboard for flourishing/thriving in Service Members (Kaur & Singh, 2022)

Similar to resilience, wellbeing is a fundamental construct for disciplines ranging from healthcare to policy. Subjective wellbeing, specifically, is a positive psychological construct that has received considerable interest as a marker of optimal human functioning (Diener et al., 1999). The concept of subjective wellbeing has been associated with decreased risk of mortality (Chida & Steptoe, 2008; Martín-María et al., 2017) and a range of salutary health outcomes among individuals with cardiovascular disease (Boehm & Kubzansky, 2012), metabolic syndrome (Boylan & Ryff, 2015), and ageing (Steptoe et al., 2015). Wellbeing has also been previously associated with adverse health behaviors, such as alcohol consumption, tobacco and substance use (Degenhardt & Hall, 2001), as well as with more global constructs such as life satisfaction, happiness, and life stress (Williams et al., 2017), mental health conditions (McManus et al., 2016), and related functional impairment (Fervaha et al., 2016). In accordance with the U.S. Military's goal to develop Service Members' strengths and support their overall thriving, both professionally and personally, the assessment and facilitation of wellbeing plays a central role in its global mission and has become an important indicator of Service Member health, resilience, and overall readiness (Bulmer et al., 2017)

Despite decades of examination, an agreed upon theory or operational definition for subjective wellbeing has escaped psychological scientists (Dodge et al., 2012). This is not due to lack of effort, as numerous papers have been published on the topic over the last 40 years (see Diener, 2009; Diener et al., 1999; Dodge et al., 2012; Linton et al., 2016; Ryan & Deci, 2001; Ryff & Singer, 1996; Weiss et al., 2016). Instead, conceptual ambiguity is more likely a reflection of the challenge in operationalizing a construct that has such significant overlap with other aspects of positive mental health (e.g., resilience, life satisfaction, happiness, contentment, coping skills), as well as cultural influences. Most commonly, subjective wellbeing has been characterized under philosophical concepts, such as eudaimonia (Ryff, 1989) and hedonia (Kahneman et al., 1999), indicating some tension in defining wellbeing as moralistic flourishing or pleasure seeking. While some scholars have described wellbeing as part of a larger aspect of social interconnectedness with others (Keyes, 1998), eudaimonic and hedonic models range from unidimensional to multidimensional latent structures. Other models describe wellbeing as processes from which individuals move towards and away from a state of wellbeing (Headey & Wearing, 1991), and therefore the process of 'being well' can be conceptualized as existing along a continuum. Conversely, the stocks and flows framework describes wellbeing in economic terms, such that personal characteristics (i.e., stocks) can be used to address life events (i.e., flows), with subjective wellbeing viewed as the net worth of life satisfaction, negative affect, and positive affect (Headey & Wearing, 1991). Finally, other theories of subjective wellbeing have adopted an ecological lens, thereby describing the concept as dynamically built by the person and shaped by social systems and norms, such as an individual's family, community, and wider society as a whole (McNaught, 2011). This perspective brings focus to the importance of culture as an influence on subjective wellbeing, which in turn affects interpretations of indices among the population being examined (La Placa et al., 2013).

Of the existing models of wellbeing, eudaimonic and hedonic perspectives have dominated the literature to date (Huta, 2016). According to proponents of the hedonic viewpoint, human beings are motivated to pursue stimuli and activities that increase pleasure and feelings of enjoyment/satisfaction, while simultaneously avoiding people, places, objects, and activities that diminish pleasure-driven outcomes (Disabato et al., 2016; Ryan & Deci, 2017). In other words, proponents of a hedonic-based view believe wellbeing to be a subjective construct that is related but still conceptually orthogonal to happiness (Ryan & Deci, 2017; Synard & Gazzola, 2017). On the other hand, eudaimonic perspectives view subjective wellbeing as a psychological construct akin to having a purpose-driven life full of satisfaction, personal growth, and in which an individual 'flourishes' (Disabato et al., 2016; Ryan & Deci, 2017; Ryff, 2014). While eudiamonic conceptual frameworks do not necessarily discount the feelings of pleasure that arise from fruitful life pursuits, subjective emotional experience is viewed as secondary to an individual's superordinate goal to have autonomy, growth, and meaning from their life (Synard & Gazzola, 2017). Indeed, there remains much debate over what is (and is not) wellbeing and how to frame this construct in relation to other measures such as happiness, life satisfaction, and resilience; however, most researchers now agree that subjective wellbeing is a multidimensional construct informed by a combination of the above factors (Diener, 2009).

In addition to the range of models describing wellbeing as a construct, numerous attempts have been made to measure this phenomenon (for a review, see Linton et al., 2016). For example, the Questionnaire for Eudaimonic Wellbeing (QEWB; Waterman et al., 2010), the 12-item Wellbeing Questionnaire (W-BQ12; Pouwer et al., 1999), and the Student Wellbeing Process Questionnaire (S-WPQ; Williams et al., 2017), among other instruments, have all received significant attention in the literature. Perhaps the most prominent measure of subjective wellbeing to date is the Psychological Wellbeing (PWB) Scale (Ryff & Keyes, 1995), which is theoretically grounded in eudaimonic traditions, as well as a range of developmental, maturational, clinical, mental health, and personality psychology conceptual frameworks. The PWB model considers the multidimensional nature of positive aspects of health and wellbeing, as well as how psychological functioning and wellness change within and between individuals across the lifespan. The PWB has six distinct subscales that address a broad array of wellness components, including “a sense of self-determination” (Autonomy), “capacity to manage effectively one’s life and surrounding world” (Environmental Mastery), “sense of continued growth and development as a person” (Personal Growth), “possession of quality relations with others” (Positive Relationships with Others), “belief that one’s life is purposeful and meaningful” (Purpose in Life), and “positive evaluations of oneself and one’s past life” (Self-Acceptance; Ryff & Keyes, 1995, pg. 720). In addition to these six subscales (factors), the PWB also has a single second-order, super-factor.

Subjective wellbeing as defined through the six-factor PWB model has been shown to be related to other important indicators of quality of health, therapeutic, and quality of life outcomes (Fava et al., 2004; Ryff et al., 2004; Smider et al., 1996). As evidence of the popularity of this measure, as of February 2023, the original paper by Ryff (1989) has been cited over 16,000 times, the CFA follow-up by Ryff and Keyes (1995) has been cited over 11,000 times, and the PWB instrument has been translated into over 30 different languages (Ryff, 2014).

Despite its widespread use over the past several decades, most factor analyses of the PWB began years after its release (Abbott et al., 2006) and existing data supporting a six-factor model have been mixed. Although some studies outside of Ryff and Keyes (1995) have provided support for the six-factor model (e.g., Kafka & Kozma, 2002; van Dierendonck et al., 2008), methodological issues have indicated need for caution when interpreting the CFA analyses. Moreover, a growing body of literature has not found support for the six-factor model. For example, Springer and colleagues (2006) detail large factor correlations among the six subscales and did not find evidence of a six-factor structure. Likewise, Triadó and colleagues (2007) were not able to support a six-factor structure using principal component analysis or CFA. While the analyses by Clarke and colleagues (2001) supported a six-factor model, they also demonstrated substantial correlation among sub-factors, (i.e., Environmental Mastery, Personal Growth, Purpose in Life, Self-Acceptance). Abbott et al. (2006) report similar correlations among sub-factors and evidence for a single factor made up of Environmental Mastery, Personal Growth, Purpose in Life, and Self-Acceptance. Burns and Machin (2009) could not reproduce the six-factor structure from the original PWB among two different populations, but they did find evidence for a 3-factor model.

Part of the confusion over the reliability and validity of the PWB can perhaps be traced to the numerous versions of the instrument that have been created since its inception. Burns and Machin (2009) describe changes in PWB item numbers across years (i.e., 120, 84, 54, 42, 18) and limited consistency in how shorter versions have been structured. These transformations can lead to issues with factorial structure. Further, it is quite common for critical errors to be made in cultural adaptation and validation of an instrument (Sousa & Rojjanasrirat, 2011), which can include cultural or linguistic issues in item meaning, or cultural appropriateness in item scaling. These limitations may also extend to organizationally-, contextually-, and culturally-distinct populations (e.g., Service Members) that often have unique perspectives on factors that influence their happiness and life satisfaction. Despite these issues, the PWB as a model and as a survey instrument remains a popular measure of wellbeing in the literature, including among military and veteran populations (e.g., Anglim et al., 2020; Bergmann et al., 2019; Brown et al., 2022; Caddick & Smith, 2014; Chen et al., 2018; Fadaei et al., 2020; Migliore & Pound, 2016) as well as in military spouses (Wang et al., 2015) and children (Sharma & Nagle, 2018), with this research often calling for changes in policy as a result of their findings (Fadaei et al., 2020).

The Current Study

With consideration to the U.S. Military's goal to develop Service Members' strengths and support their overall thriving, the assessment and facilitation of wellbeing plays a central role in its global mission. Concerningly, however, wellbeing has great variation in its conceptualization and measurement. Notable dissimilarity in the operationalization of subjective wellbeing was noted in a review of 99 instruments (see Linton et al., 2016). This conflicting evidence has led researchers to urge utilizers of these instruments to be cautious when selecting a test of subjective wellbeing and scrutinize which construct is specifically being measured. Further, as indicated above, the literature suggests that wellbeing is strongly tied to culture, and therefore is likely influenced substantially by the population being studied (La Placa et al., 2013).

With consideration to these concerns, we aimed to examine the accuracy of a subjective wellbeing assessment within a military population. For the purpose of this study, the psychometric properties of the PWB (Ryff, 1989) were examined in a large sample of pre-deployed, active-duty military personnel. As a result of the unique occupational context and culture in the military, Service Members are likely to present distinct perceptions of what contributes to their personal wellbeing (Adler & Castro, 2013; Adler & Sowden, 2018). For example, junior enlisted military personnel have an inherent lack of agency over their day-to-day schedules and responsibilities, so perceptions of autonomy may not contribute to wellbeing in the same manner as healthy young adults in the general population. With respect to the contextual considerations of military life and pertinent cultural influences (e.g., Burns & Machin, 2009; Sousa & Rojjanasrirat, 2011), as well as the wide theoretical variation in wellbeing models (e.g., Kahneman et al., 1999; Keyes, 1998; McNaught, 2011; Ryff, 1989), we expected to find inconsistency within the factorial structure of the PWB among a sample of pre-deployment Service Members. However, our goal was to evaluate the underlying theory of the PWB and if unsuccessful, attempt to arrive at a model of wellbeing for the current sample.

Method

Participants

De-identified data were accessed from the Culture, Performance and Health (CPH) study conducted from 2017-2019 with U.S. Army Service members before, during, and after their deployment to the middle east (see Adler et al., 2022).

Specifically, participants in the present study included 1,399 active-duty U.S. Army Service Members scheduled for an upcoming deployment to the middle east. This sample was more than half junior enlisted personnel (60.8% E1 – E4), predominantly male (91.2%), and mostly young adult (63.7% age 18-25). Additionally, most participants had received a high school education/equivalency (49.2%) or some college education (35.4%). A breakdown of participant demographics can be found in Table 1.

Procedure

Surveys were administered in groups of approximately 80-120 Service Members in large unit facilities, such as conference rooms, classrooms, and outdoor hangars. Prior to beginning the survey battery, Service Members were briefed by the research team about the purpose of the study, options for voluntary participation, anonymity, and data confidentiality. All Service Members included in the study first provided written informed consent, and all study procedures were reviewed and approved by the Walter Reed Army Institute of Research Institutional Review Board. Consent documents stated that only aggregate data would be shared outside the Walter Reed Army Institute of Research. Current organization policy prohibits the sharing of DOD collected data and study materials absent a formal agreement.

Measures

Psychological Wellbeing

Ryff's Psychological Wellbeing Scale (PWB; Ryff et al., 2007) is a 42-item instrument purported to assess six domains of wellbeing: autonomy, environmental mastery, personal growth, positive relations with other, purpose in life, and self-acceptance. Service Members rated each item on a six-point Likert scale from one (*strongly disagree*) to six (*strongly agree*), and the total sum of individual scale items was used for analysis. Importantly, to assist with survey clarity to the respondents, this Likert scale represents a reversal from Ryff's original scale to align it with other measures on the CPH survey. PWB subscales demonstrated good reliability in this sample (α's = .69 - .82).

Attention Check

An instructed-response item (Meade & Craig, 2012) was used as an attention check within the survey. Specifically, an item prompting the responder's attention was included between the 28th and 29th items of the PWB. The question read: "*The quality of this data is very important, so we want to make sure that your responses are valid and authentic. In your honest opinion, should we use your responses*" and was rated as either '*Yes*' or '*No*.' This type of an attention check has value in ruling out careless response styles and has been shown to not affect scale validity (see Kung et al., 2018).

Analytical Strategy

The entire sample consisted of 1614 active-duty Service Members. After the application of an attention check item, the sample was reduced to 1399 individuals. After screening for data missing at random and checking model assumptions of the planned analyses, listwise deletion was used to remove participants (n = 66, 5% of the sample) with missing data. Confirmatory factor analysis was conducted with the final sample size (N = 1,333) to determine if the six-factor wellbeing model proposed by Ryff (1989) provided adequate fit to the data. CFA was also used to assess the fit of the proposed 18-item version (Ryff & Keyes, 1995), as this is the most parsimonious model proposed in the literature. Previous studies employed differing CFA methods including different estimators, the inclusion or exclusion of a higher order factor, and adjustments to the model based on modification indices.

We initially assessed a first-order model with correlated factors in order to provide a basis for more complex models reported in previous work (Ryff & Keyes, 1995). A Weighted Least Squares (WLSMV) estimator was used for CFAs, as treating data with limited response options as continuous can lead to a problematic estimation of model fit (Flora & Curran, 2004). As a result, polychoric correlations and probit regression coefficients were used to conduct the CFA. However, given that previous studies used a Maximum Likelihood (ML) estimation based on Pearson correlations (*r*), CFAs were also conducted with ML estimators. Notably, this change did not influence the interpretation of the fit indices and therefore only WLSMV CFA results are reported. For the scaling factors, each of the first items in each of the factors was set to one for all models.

Based on the theoretical possibility that PWB may possess a novel factor structure within military populations, an EFA analysis was also conducted. Parameter estimation was conducted using MLR with a promax rotation. An oblique rotation was used as there was a correlation between subscales (Tabachnick & Fidell, 2007). For both CFA and EFA analyses, scale items were reverse scored as indicated by the PWB manual prior to the analyses.

Notably, CFA is considered a 'restrictive modeling approach,' given that direct relationships between items and non-indicated factors are purposefully constrained to zero. However, consistent with many psychological constructs, and given previous findings indicating strong associations between wellbeing subscales on the PWB, it was expected that items on the PWB would have some relationship to the other factors/constructs. In this situation, exploratory structural equation modeling (ESEM) can be helpful for evaluating complex psychological measures by testing of the hypothesized structural model while allowing for small cross-loadings (i.e., the direct relationships between items and the factors they do not indicate; Asparouhov & Muthén, 2009; Marsh et al., 2009, 2010, 2014). By allowing this cross-loading to be freely estimated (i.e., to fluctuate slightly from zero), the ESEM model can help to control inflation of latent factor correlations that can occur in standard CFA models (Asparouhov & Muthén, 2009). As such, to further investigate the CFA and EFA results, ESEM was used to examine parameter estimates and factor correlations more closely. More specifically, ESEM enables the investigation of the uniqueness of the association of measure items with their proposed latent variable (i.e., relative to non-indicated factors), as well as more reasonably evaluate associations between latent factors within the PWB.

In order to assess goodness of fit, CFI (Comparative Fit Index), TLI (Tucker-Lewis Index), and RMSEA (Root Mean Square Error of Approximation) are reported. SRMR (Standardized Root Mean Square Residual) was not reported as it has been shown to be an unreliable index of fit for WSLMV (Yu & Muthén, 2002). AIC (Akaike's Information Criteria) and BIC (Bayesian Information Criteria) are also not reported as they are not provided by MPLUS when using the WSLMV estimator and are also not reliable measures of model fit when using this estimator. Goodness of fit determinations were made based on empirically validated cut-points as described in the literature (TLI > 0.95, CFI > 0.95, RMSEA < 0.06; Bentler, 1990; Hu & Bentler, 1999; MacCallum et al., 1996). Cronbach's alphas (α) are also reported as a measure of subscale internal consistency. Confirmatory Factor Analyses (CFA) and ESEM were conducted using MPLUS (Muthén & Muthén, 2017). Descriptive and exploratory factor analyses were conducted in SPSS v24 (IBM Corp, 2016).

Results

Sample descriptives can be found in Table 1. Data from the PWB indicated that the distribution of all subscales was significantly different from normal (Skewness < 2.0; Kurtosis < 7.0; Curran et al., 1996). Subscales all demonstrated significant negative skewness. Additionally, both the Autonomy and Purpose in Life subscales demonstrated significant kurtosis. WLSMV and MLR estimators were chosen as both have been shown to be robust to non-normal distributions (Liang & Yang, 2014; Muthen & Asparouhov, 2002). Measures of internal consistency for the six subscales were acceptable: Environmental Mastery (α = .80), Personal Growth (α = .72), Positive Relationships (α = .74), Purpose in Life (α = .71), Self-Acceptance (α = .82), with the exception of Autonomy (α = .69). Subscale correlations ranged from (*r*'s = .42 - .80), with the highest correlation found between the Environmental Mastery and Self-Acceptance Subscales (*r* = .80; see Table 2).

CFA and EFA

A full list of model fit statistics can be found in Table 3 and 4. The originally proposed factor structure for the 42-item PWB, $\chi^2(810) = 31893.50$, $p < .001$, TLI = .402., CFI = .437, RMSEA = .170 (90% CI: .168-.171) and the 18 item PWB scales, $\chi^2(126) = 10713.58$, $p < .001$, TLI = .281., CFI = .408, RMSEA =.251 (90% CI: .247 - .255), provided a poor fit to the data. The estimated covariance matrix indicated that the cause of the poor fit could be contributed to higher correlations between the latent variables (See Table 2).

As a goal of the manuscript was to arrive at a model that either best characterizes the data or identifies specific contributing factors to problematic model fit, a bifactor model was also conducted. The goal of the bifactor model was to potentially decrease high correlations among factors identified in the six-factor model by including a general latent factor to account for shared variance across the PWB theory based latent factors. The bifactor model was run with the original 42-item scale. The bifactor models for both the 42-item PWB, $\chi^2(777) = 12829.25$, $p < .001$, TLI = .758, CFI = .782, RMSEA = .108, 90% CI: .106 - .110), and 18-item PWB scales, $\chi^2(118) = 3527.24$, $p < .001$, TLI = .753, CFI = .809, RMSEA = .147, 90% CI: .143 - .152), exhibited poor fit to the data. Notably, one item from the purpose in life subscale was highly associated with that latent factor (ß = .993) and lead to nonconvergence of the model. This item was set to one for that specific latent variable to achieve convergence and extract model fit statistics.

As a result of the poor fit indicated by the CFA models, an EFA was conducted to investigate whether a novel factor structure may be present in this sample. After removing significant cross-loadings ($\Delta > 2.0$), examination of Eigenvalues > 1 indicated that one or possibly two factors best characterized the data (See Figure 1). However, despite reverse scoring items consistent with recommended scoring, the identified two factor 25-item solution revealed a clear methods factor, with positively- and negatively valanced items emerging as unique factors. Due to the potential presence of a methods-driven factor, an additional CFA model was run to account for negatively valanced items. This Methods Factor CFA was associated with improved model fit, but still did not meet acceptable thresholds for model fit for both the 42-item ($\chi^2(783) = 8527.64$, $p < .001$, TLI = .846., CFI = .869, RMSEA = .086, 90% CI: .084 - .088) and 18-item measure ($\chi^2(112) = 2081.48$, $p < .001$, TLI = .850., CFI = .890, RMSEA = .115, 90% CI: .111 - .119).

Exploratory Structure Equation Modeling

To further investigate if constraining cross-loadings within the CFA were impacting model fit across the proposed models, ESEM was conducted. The six-factor ESEM model met criteria for acceptable model fit with both the 42-item (χ^2(624) = 3533.28, p < .001, TLI = .927., CFI = .947, RMSEA = .059, 90% CI: .057 - .061) and 18-item measure (χ^2(60) = 347.18, p < .001, TLI = .959, CFI = .984, RMSEA = .60, 90% CI: .054 - .066). However, interpretation of the individual item loadings indicates significant and meaningful (> .30; Asparouhov & Muthén, 2009; Marsh et al., 2009, 2010, 2014) cross loadings across factors that were similar to the factor loadings of the target variable of the proposed latent factor indicating that restricting these values to be zero as in the CFA model would not reasonably indicate actual associations between items and factors (For standardized loadings see Table 5).

As mentioned previously, significant cross-loadings may be accounted for by the inclusion of a general factor in bifactor models. Bifactor ESEM models were also conducted and were associated with a small incremental improvement in model fit for both the 42-item (χ^2(588) = 3031.69, p < .001, TLI = .925, CFI = .956, RMSEA = .056 ,90% CI: .054 - .058) and 18-item measure (χ^2(48) = 222.12, p < .001, TLI = .969, CFI = .990, RMSEA = .052, 90% CI: .045 - .059). Similar to the previous ESEMs above, examination of factor loadings indicated that the bifactor model did not account for problematic item loading as even after accounting for a general factor there was still the absence of significant and meaningful item loadings on the target latent factors and significant and meaningful cross loadings.

Discussion

The present study evaluated Ryff's six-factor model of subjective wellbeing (Ryff et al., 2007; Ryff & Singer, 1996) in a sample of pre-deployment military personnel. This study employed both CFA, EFA, and ESEM techniques to assess if the previously proposed factor structures of the Psychological Wellbeing Scale (PWB) adequately modeled data from a sample of military personnel, or if a novel factor structure emerged using the PWB items. Analyses revealed that factor structures based on Ryff's PWB model did not fit the current sample. Furthermore, using the available items proposed in the model, EFA analyses also did not arrive at an interpretable factor solution. Interpretation of EFA categorization suggested the presence of a methods factor that can be accounted for in CFA Models. Attempts to achieve model fit by accounting for negatively worded items (i.e., Methods Factor CFA) and for the presence of a shared general factor across latent factors (i.e., bifactor model) still did not arrive at a model with acceptable model fit. Acceptable model fit was achieved with ESEM models; however, examination of parameter estimates indicated significant cross loadings across latent factors as well as target items being less strongly associated with their proposed factor than another factor.

These results appear to be consistent with the mixed literature which has failed to definitively confirm the proposed structure of the PWB model. Although some studies have provided evidence for acceptable model fit (Kafka & Kozma, 2002; van Dierendonck et al., 2008), numerous others have identified poor fit for the PWB six-factor model (Abbott et al., 2006; Clarke et al., 2001; Triadó et al., 2007). Also consistent with our findings, these latter studies identify a high degree of correlation between subscales, a lack of unique association with proposed factors, and inadequately defined factors by the proposed items, as reasons for a lack of acceptable model fit. Notably, findings from the current study indicated a unique 'methods factor' for both the 42-item and 18-item models, comprised of the positively and negatively valanced items in the PWB. However, accounting for a methods factor still did not improve model fit to acceptable thresholds among Service Members. Lastly, ESEM findings indicated large and meaningful cross-loadings across the majority of items, further supporting extant findings highlighting lack of item specificity as a major concern for the psychometric structure of the PWB (Burns & Machin, 2009; Triadó et al., 2007).

Examination of both the factor intercorrelations and the factor cross-loadings from the ESEM analyses indicate the strongest overlap was between items on the environmental mastery and self-acceptance subscales (r = .80). This strong correlation may be partially due to unique contextual factors within the military, for example job satisfaction, job performance, and the ability to effectively cope with normal military stressors are strongly associated with psychological health (Pflanz & Ogle, 2006; Varas et al., 2019), quality of life and positive psychological adjustment in military samples (Pecko, 2003; Wang et al., 2015). Notably, analyses indicated that items on the personal growth and purpose in life subscales (r = .74) also appears to structurally overlap. This may be partially due to that fact that in a population highly identified with their career progression, purpose in military service and purpose in life are strongly associated (Trachik et al., 2020, 2021; 2022).

Although there appears to be a growing body of literature identifying incongruencies between the PWB and its theoretical underpinnings, to our knowledge this study is the first study to evaluate model fit in an active-duty military population. Further, findings from the current study not only comprehensively attempt to adequately model the PWB (e.g., basic structure replication, EFA, methods factors), but provide direct supporting evidence indicating the base cause for the lack of structural fit within this unique population. Given the ostensive systematic cultural onboarding process inherit to military service, it is possible that factors which might accurately characterize wellbeing in a civilian population are inconsistent or insufficient to capture this construct in a military population. Aligning with this interpretation, researchers have previously pointed out that like other positive psychology constructs, wellbeing in particular may be greatly influenced by one's cultural context (La Placa et al., 2013) and systems-level organizationl environment (McNaught, 2011). These factors are likley highly relevant in a military context (e.g., autonomy and agency may directly impact on Service Member's perceptions of satisfaction) and require further elucidation by empirical efforts if meaningful wellbeing research is to be conducted in the future within military populations.

Limitations and Future Directions

The current study has many strengths including a large and unique military sample. However, several limitations should be considered when evaluating and interpreting these data. Perhaps the most significant limitation in this study is that the PWB scale was revised to match other instruments on a large survey battery. Specifically, the PWB Likert scale was re-oriented so that higher numerical responses indicated better subjective wellbeing (i.e., "strongly disagree" to "strongly agree" instead of "strongly agree" to "strongly disagree"). Additionally, the wording of specific items was subtly changed to increase clarity for a military population. Although it is possible that these changes impacted model fit, it is unlikely that they impacted fit to the degree observed in the analyses. Specifically, examination of modification indices did not show that items with revised wording had a detrimental impact on model fit over and above items without revisions and modified items did not show stronger associations with non-target latent factors. Given these limitations, future research should consider several options. First, although alterations were minimal and introduced to improve participant understanding of questions/accuracy of responding, additional research is needed within other military samples to replicate the current findings using the PWB without any alterations. Second, future research aimed at improving the PWB may consider revising the current items to more strongly differentiate cross-loaded items enabling these items to load appropriately onto their respective wellbeing subconstruct. Revision of the wellbeing construct may also consider the development and inclusion of additional military-specific aspects of wellbeing that may not be currently captured within the PWB (e.g., purpose in service, cohesion, relationship with leaders; Brooks & Greenberg, 2018) and a re-evaluation of specific items that may not include contextual considerations such as the structure of social support networks in an culture requiring frequent relocations (Pecko, 2003).

Conclusions

The present study found that the theoretical model proposed by Ryff's PWB model did not fit a military sample, and the proposed factors did not result in a novel model for this population. Generally, our findings are consistent with literature demonstrating difficulty in structurally validated Ryff's model of wellbeing. The findings of this study are important for military researchers to consider as the PWB is a widely used scale in military and veteran populations (e.g., Anglim et al., 2020; Bergmann et al., 2019; Brown et al., 2022; Caddick & Smith, 2014; Chen et al., 2018; Fadaei et al., 2020; Migliore & Pound, 2016) and recent military initiatives are proposing interventions with psychological wellbeing as a primary outcome, such as the Army's People First Strategy (Grinston et al., 2019). Additionally, a recent congressionally directed report (Suicide Prevention & Response Independent Review Committee; SPRIRC; 2022) called for organizational and policy changes within the military with the goal of increasing Service Member wellbeing. This report will likely initiate significant policy changes with future programming requiring empirical validation with established measures. Further research is needed to establish new and contextually invariant measures to increase the applicability of the overall constructs of eudaimonic /psychological wellbeing. Future research should continue to evaluate proposed models of Soldier wellbeing and propose novel theories, as well as measures, to assess this important construct. Understanding the core elements that may be unique to this population could assist with not only mental health and resilience interventions, but also uncover previously unevaluated strategies for increasing Service Member performance. Consistent with the proposed goals of emerging Army programs, such as Comprehensive Soldier Fitness (Cornum et al., 2011) and the People First Strategy (Grinston et al., 2019), a nuanced understanding of wellbeing in Service Member populations is required. This is especially true if the Department of Defense strives to move away from defining adequate functioning as simply the absence of pathology and instead focuses on enhancing thriving and flourishing in order to improve the lives and performance of Service Members both on and off the battlefield (SPRIRC; 2022).

Tables

Table 1. Demographics

Variable	***N* (%)**
Age	
18 – 25	878 (63.7%)
26 – 35	408 (29.229.6%)
36 – 39	57 (4.1%)
40 or older	36 (2.6%)
Gender	
Male	1,271 (91.2%)
Female	123 (8.8%)
Rank	
E1 – E4	784 (60.8%)
E5 – E6	298 (23.1%)
E7 – E9	70 (5.4%)
Officer or WO	137 (10.6%)
Education	
High school diploma/GED	682 (49.2%)
Some college/Associates	490 (35.4%)
Bachelor’s degree	196 (14.2%)
Graduate degree	17 (1.2%)
Total (*N*)	1399

Note: Data reported inclusive of item responders and valid percent reported; < 2% data missing across variables.

Table 2. Subscale Pearson's (*r*) Correlations

	Autonomy	Environmental Mastery	Personal Growth	Positive Relationships	Purpose in Life	Self-Acceptance
Autonomy	-	.52	.50	.42	.48	.52
Environmental Mastery		-	.62	.67	.65	.80
Personal Growth			-	.60	.74	.63
Positive Relationships				-	.62	.71
Purpose in Life					-	.67
Self-Acceptance						-
Mean Item Response	3.31	3.16	3.37	3.24	3.10	3.13
SD	.82	.92	.83	.66	.89	.96
α	.69	.80	.72	.74	.71	.82

Note. *SD* = standard deviation; *α* = Cronbach's alpha

Table 3. Competing CFA and ESEM measurement models (42-items)

Confirmatory Factor Analytical Models	*N*	χ^2	χ^2 sig	*df*	CFI	TLI	RMSEA (90 % C.I.)
Six-factor	1333	31893.50	0.000	810	0.437	0.402	0.170 (.168 - .171)
Bifactor	1333	12829.25	0.000	777	0.782	0.758	0.108 (.106 - .110)
Methods factor, neg	1333	8527.64	0.000	783	0.860	0.846	0.086 (.084 - .088)
Exploratory Structural Equation Models							
Six-factor	1333	3533.28	0.000	624	0.947	0.927	0.059 (.057 - .061)
Bifactor	1333	3031.69	0.000	588	0.956	0.935	0.056 (.054 - .058)

Note. *N* = total sample size; χ^2 = Chi-square goodness of fit test statistic; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root-mean-square error of approximation.

Table 4. Competing CFA and ESEM measurement models (18-items)

Confirmatory Factor Analytical Models	*N*	χ^2	χ^2 sig	*df*	CFI	TLI	RMSEA (90 % C.I.)
Six-factor	1331	10713.58	0.000	126	0.408	0.281	0.251 (.247 - .255)
Bifactor	1331	3527.24	0.000	118	0.809	0.753	0.147 (.143 - .152)
Methods factor, Neg	1331	2081.48	0.000	112	0.890	0.850	0.115 (.111 - .119)
Exploratory Structural Equation Models							
Six-factor	1331	347.28	0.000	60	0.984	0.959	0.060 (.054 - .066)
Bifactor	1331	222.12	0.000	48	0.990	0.969	0.052 (.045 - .059)

Note. *N* = total sample size; χ^2 = Chi-square goodness of fit test statistic; *df* = degrees of freedom; CFI = comparative fit index; TLI = Tucker-Lewis index; RMSEA = root-mean-square error of approximation.

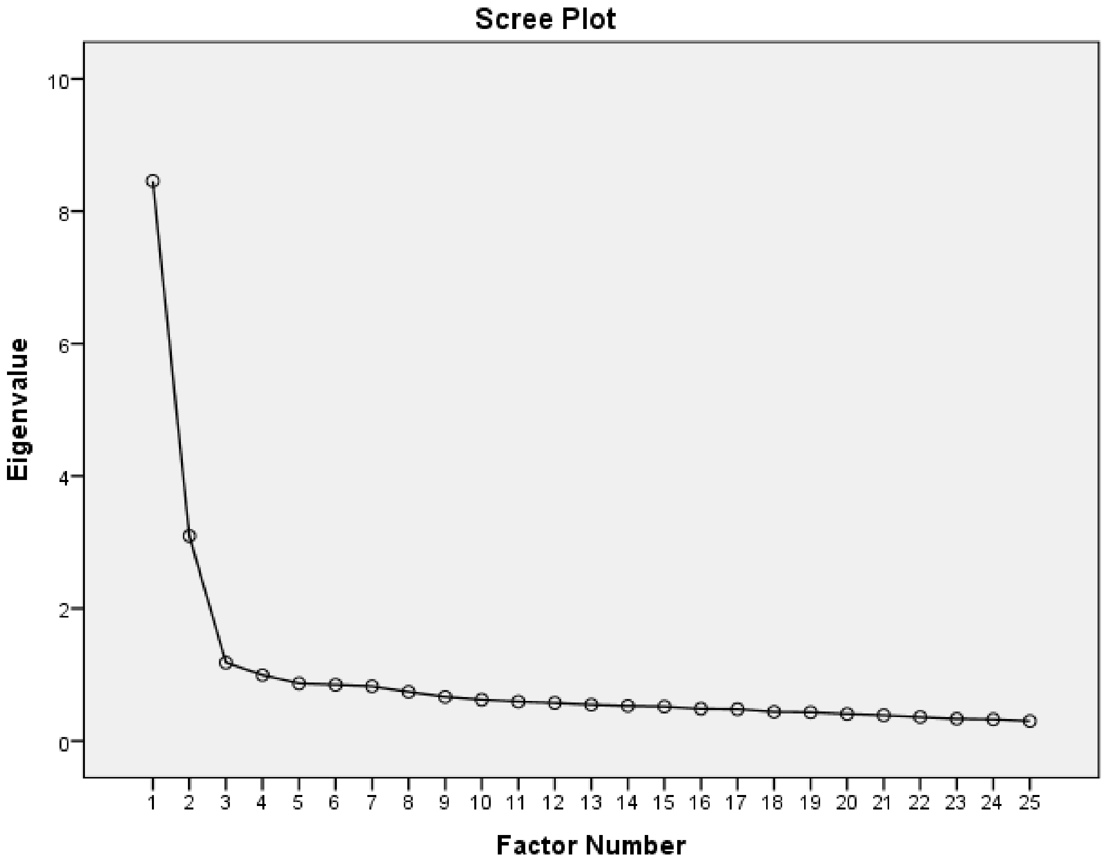
Table 5. Bifactor ESEM 6-factor standardized factor loadings (18-items)

	General	Aut	Envm	PerGrw	Pos Rel	Purp Life	Self-Acc
WB19	.230***	.441***	.211***	.064	.112***	.158***	.025
WB25	.732***	.415***	-.138***	-.026	-.119***	-.122***	-.177***
WB37	.376***	.217***	-.112***	.014	-.237***	.153***	-.141***
WB02	.576***	.070**	.122***	-.046	-.022	-.094**	.348***
WB08	.499***	.006	.702***	-.019	.216***	.011	.117***
WB20	.682***	-.032	.055*	.028	-.076**	-.029	-.003
WB09	.599***	-.053	-.116***	.349***	-.192***	-.004	-.097***
WB33	.625***	-.113***	-.019	.181**	-.266***	.163***	-.117***
WB39	.573***	.152***	.043*	.391**	.250***	.266***	.106**
WB10	.446***	-.078**	.280***	-.129***	.469***	.087**	.058*
WB28	.618***	-.152***	-.176***	.097	.026	-.100***	-.158***
WB34	.513***	-.034	.016	.081*	.566***	.014	.114***
WB05	.089*	-.001	-.047	.177**	.029***	.448***	-.193***
WB35	.612***	-.002	-.034	-.127**	-.123***	.461***	.075***
WB41	.405***	.209***	.065*	.460***	.221***	.242*	-.014
WB06	.577***	-.110***	.070***	-.092***	.001	-.158***	.663***
WB24	.826***	.147***	-.092***	-.113**	.002	-.149***	-.120***
WB30	.604***	.007	.228***	.054	.368***	.112***	.290***

Note. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Figures

Figure 1. EFA Scree Plot



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