



Happy Soldiers are Highest Performers

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Abstract

We examined the prediction of affective well-being to work performance in the United States Army. We found that high positive affect (PA), low negative affect (NA), and high optimism predicted awards for performance and heroism in a sample of 908,096 U.S. Army soldiers (mean age 29.60 years old, $SD=9.16$ years; with over $\frac{1}{4}$ of a million ethnic minorities and over 150,000 women). Baseline high PA, low NA, and high optimism predicted awards over a four-year follow up window, in which 114,443 soldiers (12.60%) received an award. Each well-being variable predicted future awards for both women and men, for enlisted soldiers as well as officers, for several ethnicities, for varying levels of education, and controlling for a number of other potential explanatory variables. The effects of high positive and low negative affect were additive, with each predicting significantly beyond the other. Comparing the soldiers highest vs. lowest in well-being predicted an almost four-fold greater award recognition in the high group. Awards were predicted by both high and low arousal positive emotions, as well as low sadness and low anger. The relations between PA, NA, and optimism with award attainment were curvilinear, with the greatest difference in award attainment occurring between low and moderate levels of affective well-being, with little effect between moderate and high well-being.

Keywords Subjective well-being · Positive affect · Negative affect · Optimism · Performance

In recent decades, research indicates that high levels of subjective well-being (SWB) are associated with beneficial outcomes such as health and citizenship (Diener & Biswas-Diener, 2018; Diener et al., 2015). In addition to positive affect (PA) and negative affect

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(NA), dispositional optimism, too, has been associated with multiple benefits, including better health (Rasmussen et al., 2009), an energetic task-focused approach to goals (Carver et al., 2009), and better social relationships (Srivastava et al., 2006). Yet, there also is a long scholarly tradition of examining employee well-being in relation to work outcomes. Indeed, while much of this original workplace research focused on job satisfaction, the focus shifted more recently to the link between affective well-being and work performance (Kaplan et al., 2009).

A review of the evidence indicates that SWB is associated with work performance and income, with longitudinal and some experimental evidence suggesting that this might be a causal association (Tenney et al., 2016). In general, high positive affect has been associated with better work performance, and high negative affect with poorer performance, and we see this across populations, types of work, and types of well-being, as well as the shape of this relationship (Lyubomirsky et al., 2005). Optimism, too, can have a powerful influence on work performance (Jensen et al., 2007; Luthans et al., 2008; Seligman & Schulman, 1986; Youssef & Luthans, 2007), though it must be realistic, as optimism can suffer from the “too much of a good thing” phenomenon (Hmieleski & Baron, 2009; Tenney et al., 2015).

The SWB and optimism literatures are quite extensive, so much so that over 170,000 scholarly articles mentioning SWB alone were published between 1999 and 2018 (Diener et al., 2018). Despite this, many important questions about SWB and optimism remain unanswered, especially those that would require significant sample diversity and power to properly examine. For example, many of the published studies examining SWB employ the PANAS, which measures many discrete emotions, but what is reported is typically restricted to dimensional effects because the studies often lack the power to examine how those discrete emotions alone influence outcomes (Tenney et al., 2016). Likewise, while the “too much of a good thing” phenomenon has garnered significant attention in the workplace literature of late (Pierce & Aguinis, 2013), little is known about the curvilinear properties of the general levels of SWB and optimism on performance; at what point does happiness or optimism begin to negatively impact job performance? As outlined by Diener and coauthors (2018), the literature has yet to establish how job characteristics and demographics might moderate the link between SWB or optimism and work performance; most studies on SWB lack sample diversity and power to examine these questions. Finally, while several studies have examined the relationship between SWB and work performance writ large (Judge et al., 2010; Wright et al., 2007), the literature offers little explanation for how SWB might influence objective *exemplary* performance (Tenney et al., 2016).

Thus, the goal of the present study is to explore these areas, along with others described later. Access to an enormous and diverse data set of service members from the US Army allowed us to examine these areas with specificity and statistical power; this study includes data from over 900,000 service members across seven years of analysis. We begin with an overview of the criterion variable—Army performance awards—to provide context, while also describing both the awards system and prevalence of award attainment in the Army. We then return to a deeper discussion of important but unanswered matters connected to SWB, optimism, and performance, we next summarize the contributions of the current study, then move on to the pro forma sections of our empirical study.

1 Army Awards

As highlighted by Carpini and coauthors (2017), the workplace literature often frames certain constructs as performance when they clearly are not (e.g., organizational citizenship behaviors, creativity). Fortunately, U.S. Army awards are a highly accurate performance metric because they neatly fit the definition of performance, where “performance means to do or act” (Frese & Fray, 2001, p. 173). Thus, performance must be observable. Army regulations require that performance awards be given for observable behavior, and these observations are meticulously documented in paperwork twice, once on the award certificate presented to the soldier, and once on the nomination form completed by the leader nominating the soldier for the award. Although not unique, we submit that this level of observable performance-award specificity is quite rare in the literature.

The Army has three broad categories of individual awards—heroism awards, service awards for performance (hereafter, “performance awards”), and service awards for participation. Heroism awards are performance awards, where a soldier risks his or her life in specific combat contexts (e.g., Medal of Honor, Silver Star) or non-combat contexts (e.g., Soldier’s Medal), and they are rare because the context calling for such action is rare. The soldier must take action that warrants such an award, a witness must see the soldier’s action, then prepare a narrative and nominate the soldier for the award, and then the soldier’s commanders must approve the award. For the wars in Iraq and Afghanistan, heroism awards were under such high scrutiny that they often required the approval of a service secretary (e.g., the Secretary of the Army), meaning that the award nomination packet must be reviewed and endorsed by 6–7 echelons of leadership prior to final approval. To provide context for the rarity of receiving a heroism award, over 3 million service members have served in Iraq or Afghanistan since 2001. Of those 3 million, many service members have deployed to combat multiple times, for a total of over 6 million individual deployments; only 1007 Silver Stars have been awarded across all military branches over the last 20 years (~0.016%) (U.S. Department of Defense, 2020).

Soldiers also receive awards for job performance, and these can be given for discrete instances (e.g., a soldier wins the Soldier of the Quarter competition and is awarded the Army Achievement Medal) or longitudinal performance (e.g., a soldier performs in exemplary fashion for three years in a specific organization and is awarded the Army Commendation Medal). Service awards for performance are more common than heroism awards but receiving them is predicated on excellent job performance and they are still relatively rare. Like heroism awards, performance award nomination packets are also heavily scrutinized and usually must be endorsed by 3–4 echelons of leadership prior to final approval. Lastly, soldiers may receive an award for participating in a particular event, such as deploying to a combat theater of operations or for simply being a member of the armed forces when a national emergency was declared (e.g., the National Defense Service Medal). Because service awards for participation are common and can be given en masse to all members of an organization, this award type is not necessarily indicative of exemplary performance, and we did not include it in our analyses.

2 Literature Review and Contributions

A consistent theme raised within the well-being and workplace literature focuses on understanding the conditions in which happiness and optimism matter the most vis-à-vis work performance (Diener et al., 2017a, 2017b; DiMaria et al, 2020). For example, Lucas and Diener (2003) predicted that well-being might be more important to performance primarily

in settings where work is less structured and routinized, and where the work requires more creativity and initiative. Their prediction was based on the notion that structured and routinized work typically lacks autonomy and tends to be overly prescriptive, yet they did not present evidence to directly support this hypothesis. The Army dataset allows us to explore this hypothesis because it includes data from two broad categories of employees, enlisted soldiers (e.g., Privates, Sergeants) and officers (e.g., Lieutenants, Captains). Generally, work performed by enlisted soldiers tends to be more prescribed and routinized, whereas work performed by officers tends to be more autonomous and somewhat self-driven.

Beyond understanding when well-being and optimism matter the most to work performance, another lingering question in the literature is for whom does well-being and optimism matter more for work performance (Diener et al., 2018). Importantly, our current study may help to settle this important issue. Broadly, the research suggests that ratings of well-being tend to be quite similar between men and women (Fujita et al., 1991), and most slight variations are accounted for by country of origin or cultural factors (Meisenberg & Woodley, 2015). Likewise, research also highlights how race (Waldman & Avolio, 1991) and gender (Greenhaus & Parasuraman, 1993) factor into work performance evaluations, though not actual performance. Thus, while there are certainly published studies examining the role that demographics play in reported subjective well-being or how work performance might be evaluated, we are unaware of robust studies that accurately account for demographic differences between well-being and work performance. Our sample provides enough statistical power to effectively examine several demographic categories, including race, gender, education level, marital status, employment tenure, and full time (active duty) vs. part time (National Guard and Army Reserve) employment status. If demographic differences exist, we expect them to be small.

An additional matter in the well-being literature needing exploration is measurement specificity. Well-being scholars tend to divide emotions primarily into dimensions, with positive and negative affect the two most important dimensions (Russell, 2003). Doing so makes sense heuristically and methodologically, but the obvious tradeoff is precision. Less explored are the discrete emotions comprising each of the affective dimensions (e.g., Izard, 1997). A review by Kaplan and coauthors (2009) concluded that both positive and negative affect dimensions are associated with various aspects of job performance. In a meta-analysis of the literature, Shockley and coauthors (2012) found that most associations were due to general dimensional effects rather than to discrete emotions, but this was not surprising and in large part was a methodological artifact owing to the statistically underpowered nature of many of the studies included in the meta-analysis. Choi and coauthors (2020) found that a latent trait of general well-being accounted for associations with various desirable behavioral outcomes such as health behaviors, with no significant additional associations found for the separate types of well-being. Despite what these studies reported, the dimension vs. discrete question lacks a conclusive answer and thus we categorize emotions in each of these ways and examine their association with performance. Specifically, our study's large statistical power enables us to determine whether high positive and low negative affect each predict performance beyond the common variance they share, while also examining discrete emotions. Thus, we divide positive emotions into two major types, low and high arousal, and examine three of the most important forms of discrete negative emotions—sadness, anger, and worry. This approach is noteworthy because within these negative emotions, Shockley and coauthors (2012) found that only sadness produced lower performance. Data on optimism are also measured by the Army and therefore are included in our analyses, although in line with previous research (Carver et al., 2014), we expect optimism associations to be similar to those of positive affect.

Beyond the dimensional vs. discrete emotion debate, additional focus on arousal levels is warranted because they would also likely differentially predict performance. Simply put, individuals with high positive arousal levels measured in the current study (e.g., enthusiasm, joy, and excitement) could be energized to perform well in work tasks (Larson & Diener, 1992). This assertion is consistent with more recent literature, such as the Broaden-and-Build theory of positive emotions (Fredrickson, 2001), where positive emotions can lead to upward spirals of performance. There are some additional indicators within the literature suggesting that arousal level does influence factors related to performance (Lyubomirsky et al., 2005), such as curiosity and exploration (Kashdan et al., 2004), intentions to quit, and conflict with coworkers (Van Katwyk et al., 2000). Past findings from the health arena also suggest that high arousal PA might not be as beneficial as low arousal (Pressman & Cohen, 2005). Most research on well-being outcomes, however, has not differentiated between high and low arousal positive and negative feelings. Therefore, in addition to examining general PA, optimism, and general NA, we examine whether different arousal levels vary in their prediction of performance. Here, we examine both low and high arousal PA, as well as low and high arousal NA. Further, an unresolved question in the literature relates to how each type of well-being and optimism might work in concert to predict performance (Tenney et al., 2016). Framed more succinctly, is the predictive power of PA, optimism, and NA on performance due to their overlap or to unique variance in each? And, are their effects additive or interactive? In sum, we examined both broad and narrow affective well-being measures as predictors of performance, both individually and together.

Another important yet unresolved matter within the well-being literature is determining if the relationship between affect and work performance departs from linearity. Specifically, two questions emerge: First, do the effects of well-being show declining marginal patterns, such that the benefits are strongest moving from low to moderate levels, and then decline as one moves to higher levels? Second, do those highest in well-being accrue the most benefits, or is there a downturn in performance after some inflection point? These questions dovetail with reviews by both Pierce and Aguinis (2013) and Grant and Schwartz (2011), who hypothesized a “too-much-of-a-good-thing” pattern emerges, such that performance initially improves but begins to drop off after typically desirable management characteristics are taken to the extreme and saturate a workplace. What results is a nonlinear relation between the construct of interest and performance, which has been empirically illustrated in the literature repeatedly, including personality (Le et al., 2011), optimism (Brown & Marshall, 2001; Haaga & Stewart, 1992; Hmieleski & Baron, 2009; Tenney et al., 2015), persistence (Moon, 2001), generosity (Flynn, 2003), experience (Sturman, 2003), learning orientation (Bunderson & Sutcliffe, 2003), and various forms of leadership (Cheong et al., 2019; Trevino et al., 2000). With these compelling findings in mind, we would reasonably expect to see a similar nonlinear relation between well-being and performance, and the current literature suggests this might be the case, albeit inconclusively. For example, Oishi and coauthors (2007) found a linear relation between well-being and social relationships, with the highest well-being individuals having the best social lives. However, for income, the association peaked at a moderately high level of well-being, but it dropped off at maximal affective well-being. Thus, going from very low to moderate levels might facilitate performance, but above moderate levels, the gains might be small or even reversed. In the present study, our very large sample enables us to reliably examine the curvilinear effects in order to ascertain whether intermediate levels of affective well-being are optimal for performance.

Moreover, we also intend to use this sample to accurately and perhaps conclusively quantify the strength of the prediction of well-being and optimism on performance. Given

the wide range of factors and interactions that could come together to influence performance, it is likely that the effects of well-being and optimism on performance are small, but still both statistically and practically significant. This would accord with a long-running debate about the beneficial effects of job satisfaction, where Iaffaldano and Muchinsky (1985) argued that the effects of job satisfaction on performance are small; they found correlations in the 0.17 range. Later, Judge and coauthors (2001) disattenuated the association for the unreliability of measures and argued that the correlation between job satisfaction and performance is about .30. Returning to well-being, a systematic analysis of the size of the effects of PA and NA on performance in a very large and very diverse sample enables us to reliably estimate the magnitude of predictions for various well-being types and in various subgroups.

Finally, as our repeated reference thus far to statistical power and our demographically diverse sample insinuates, we fully expect the current study to reinforce several findings previously published in the literature; indeed, we view this as an important contribution to the literature. Replication in behavioral science research can no longer be assumed, as evidenced by the compelling findings reported by the Open Science Collaboration (2015). With this in mind, our study leverages several methodological strengths to examine if well-being and optimism predict outstanding performance. As we describe in more detail below, this study is longitudinal and controls for numerous potential confounds, thus improving the strength of the inferences made about how well-being and optimism influence performance. Second, we rely on an objective outcome—attainment of heroic performance or job performance awards—rather than self-reports of work performance. Third, whereas past research has analyzed the range of work performance, and thus might be heavily influenced by weak performance of unhappy employees, we examined the other end of the spectrum—exemplary performance.

3 Summary of the Major Contributions

Using a very large and diverse longitudinal sample, we were able to address several important questions about well-being and optimism with precision, specificity, and statistical power. For context, the sample size within each of our demographic categories often exceeds the pooled sample size of most published meta-analyses on well-being and optimism.

1. We examined the two major dimensions of affect, PA and NA, as well as key discrete emotions (low and high arousal PA, as well as sadness, anger, and worry), in relation to work performance.
2. We examined the predictive power of affective well-being in differing types of work, where officer versus enlisted status and level of education served as proxies for differing types of work.
3. We analyzed whether the well-being and work association is generalizable across demographic groups, including ethnic minorities and gender, as well as education.
4. We explored two types of work performance—a performance award based on exemplary work behavior over time and heroic performance that depends on exceptional risk to life in an episode.
5. We accurately estimated the strength of the associations between the various types of well-being measures and work performance.

6. Finally, we analyzed whether performance is predicted by well-being in a linear or curvilinear way, in order to determine if there are diminishing returns to performance with increasing levels of well-being, and if there is an inflection point after which there is less superior performance.

4 Method

4.1 Study Subjects

We examined a cohort of 908,096 Army active duty, Reserve, and National Guard soldiers who were 17–65 years of age at baseline, completed the Army Global Assessment Tool (GAT) between October 1, 2009 and September 30, 2012, and indicated through an electronic “opt-in” procedure that their responses could be used for research purposes. We then assessed if participants received an award *after* completing the GAT used in this study; the awards assessment follow up period ran through September 30, 2016. The university’s Institutional Review Board and the Army Human Research Protections Office regulatory authority both approved the current study.

4.2 Measures

4.2.1 Well-being

Three measures of baseline affective well-being were taken from the GAT (Version 1.0), a self-report psychosocial questionnaire that Army soldiers completed annually. The GAT is not a standalone psychometric instrument but rather is a collection of validated measures commonly found in the literature (Peterson et al., 2011; Vie et al., 2016). The present study draws from relevant measures found on the GAT, described below.

Ten PA items were used from the Positive and Negative Affect Schedule Expanded Form (PANAS-X; Watson & Clark, 1994) and assessed on a 1 (*never*) to 5 (*most of the time*) Likert response scale. Questions assessed general PA over the past four weeks (e.g., “inspired,” “happy,” “proud,” and “calm”) and were internally consistent ($\alpha = 0.94$). In addition to assessing general PA, we also employed subscale scores reflecting high arousal PA (“enthusiasm,” “joy,” and “excitement”; $\alpha = 0.86$) and low arousal PA (“calmness,” “contentment”; $\alpha = 0.80$). Across all PA measures, higher scores indicate higher PA levels.

Eleven NA items were also adapted from the PANAS-X (Watson & Clark, 1994). Questions assessed general NA over the past four weeks (e.g., “distressed,” “scared,” “angry,” “guilty,” and “sad”) and were internally consistent ($\alpha = 0.90$). In addition to assessing general NA, we also formed two high arousal subscales (hostility [“angry,” “hostile”; $\alpha = 0.77$], and anxiety [i.e., “anxiety,” “fearfulness”; $\alpha = 0.69$]) and assessed low-arousal NA with a single item (i.e., “sadness”). Across all NA measures, higher scores indicate higher NA levels.

Four optimism items were adapted from the revised Life Orientation Test (Scheier et al., 1994). Respondents indicated their agreement with four statements (e.g., “Overall, I expect more good things to happen to me than bad”) using a five-point response scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). After reverse scoring the negatively

worded items, we averaged the optimism items, with higher scores indicating higher optimism levels. Optimism items demonstrated adequate internal consistency ($\alpha = 0.75$).

4.2.2 Awards

This study examined Army heroism and performance awards (for a full list, see Table 1). We examined both *whether* a soldier received a heroism or performance award during follow up, and separately, we examined the *type* of award received (heroism award, performance award only, or neither).

4.2.3 Demographic and Military Characteristics

Demographic and military characteristics were derived from electronic administrative records housed at the Defense Manpower Data Center and were assessed at the time of each soldier's baseline GAT. Demographic characteristics included as predictors at baseline were gender (male or female), age (years), race/ethnicity (White or other ethnic groups), educational attainment (high school educated and below or greater than high school) and marital status (married, never married, other).

Military characteristics included as control variables at baseline included deployment status (prior deployment versus no prior deployment), rank (enlisted soldier or officer), service component (active duty, Reserve, or Guard), length of Army service (years), and prior award attainment (received versus did not receive a heroism or performance award before baseline). Because approximately 20% of the soldiers left the Army during the follow-up window, we also accounted for length of follow up (years); please see Table 2 for detailed descriptive statistics.

Table 1 Awards included in this study, by type

| Heroism awards | Performance awards |
|---|--|
| Medal of Honor | Defense Distinguished Service Medal |
| Distinguished Service Cross* | Army Distinguished Service Medal |
| Silver Star Medal | Defense Superior Service Medal |
| Distinguished Flying Cross | Legion of Merit |
| Soldier's Medal | Bronze Star (without V device) |
| Bronze Star (with V device) | Defense Meritorious Service Medal |
| Purple Heart | Meritorious Service Medal |
| Air Medal (with V device)* | Air Medal (without V device) |
| Army Commendation Medal (with V device) | Army Commendation Medal (without V device) |
| Army Achievement Medal (with V device)* | Army Achievement Medal |
| | Military Outstanding Volunteer Service Medal |

*Although included in the heroism category, these awards were not observed in the sample during the study follow up period. We excluded awards with a narrow eligibility pool (e.g., specific occupations, deployment locations, military units, or components), as well as awards associated with other services (Navy, Coast Guard, Air Force, Marine Corps)

Table 2 Descriptive statistics by award status

| Characteristic | No award (<i>N</i> = 793,653) 87.40% | Award (<i>N</i> = 114,443) 12.60% | Effect size ^a |
|--|---|--|--------------------------|
| Positive Affect: <i>M</i> (<i>SD</i>) | 3.73 (0.79) | 3.85 (0.72) | .159 |
| Negative Affect: <i>M</i> (<i>SD</i>) | 2.24 (0.70) | 2.13 (0.62) | -.166 |
| Optimism: <i>M</i> (<i>SD</i>) | 3.71 (0.83) | 3.82 (0.76) | .138 |
| Age, in years: <i>M</i> (<i>SD</i>) | 29.60 (9.26) | 29.56 (8.54) | -.004 |
| Years in service: <i>M</i> (<i>SD</i>) | 9.16 (8.99) | 9.33 (8.54) | .019 |
| Years of follow-up: <i>M</i> (<i>SD</i>) | 3.55 (1.01) | 3.94 (0.39) | .509 |
| Gender: <i>n</i> (%) | | | |
| Male | 653,345 (82.87%) | 98,164 (85.78%) | 1.04 |
| Female | 135,021 (17.13%) | 16,278 (14.22%) | 0.83 |
| Race/Ethnicity: <i>n</i> (%) | | | |
| White, Non-Hispanic | 508,597 (64.51%) | 82,368 (71.97%) | 1.12 |
| Black | 151,161 (19.17%) | 15,530 (13.57%) | 0.71 |
| Hispanic | 82,482 (10.47%) | 10,582 (9.25%) | 0.88 |
| Other | 46,148 (5.85%) | 5,963 (5.21%) | 0.89 |
| Prior Awards: <i>n</i> (%) | | | |
| None | 735,650 (92.69%) | 51,966 (45.41%) | 0.47 |
| One or more | 58,003 (7.31%) | 62,477 (54.59%) | 7.47 |
| Rank: <i>n</i> (%) | | | |
| Enlisted | 671,751 (85.21%) | 94,123 (82.25%) | 0.96 |
| Officer | 116,636 (14.79%) | 20,319 (17.75%) | 1.20 |
| Deployment before study: <i>n</i> (%) | | | |
| Deployed | 432,293 (54.47%) | 61,846 (54.04%) | 0.99 |
| Did not deploy | 361,360 (45.53%) | 52,597 (45.96%) | 1.01 |
| Army Component: <i>n</i> (%) | | | |
| Active duty | 412,173 (52.28%) | 36,761 (28.30%) | 0.54 |
| Reserve | 179,790 (22.80%) | 1,448 (1.27%) | 0.06 |
| National Guard | 196,423 (24.91%) | 76,234 (66.61%) | 2.67 |
| Education: <i>n</i> (%) | | | |
| Up to high school diploma | 611,961 (77.95%) | 87,330 (76.44%) | 0.98 |
| More than high school | 173,125 (22.05%) | 26,912 (23.56%) | 1.07 |
| Marital Status: <i>n</i> (%) | | | |
| Married | 389,667 (49.50%) | 57,027 (49.85%) | 1.01 |
| Never Married | 347,524 (44.14%) | 50,533 (44.18%) | 1.00 |
| Other | 50,103 (6.36%) | 6,831 (5.97%) | 0.93 |

^aThe effect size is Cohen's *d* for the six quantitative variables and a proportion ratio for each level of the eight categorical variables. All variables were significantly related to award status at $p < .01$ except for Age. The No Award and Award groups were compared using an independent-samples *t*-test (equal variances not assumed) for the six quantitative variables and a chi-square test of independence for the eight categorical variables

4.3 Statistical Analyses

Analyses were performed using SAS, version 9.4, in the Person-Event Data Environment, a secure, cloud-based environment that houses Army workforce, medical, and personnel data (Vie et al., 2013, 2015). Logistic regression models were used to predict future award attainment from baseline PA, NA, and optimism. We did not impute missing data because our sample size was very large and less than 2% of our sample had missing values for well-being or other key measures. Gender, age, race/ethnicity, education level, marital status, military rank, prior deployment, Army component, military service length, prior award attainment, and follow-up length in years were included as control variables.

Quadratic effects for each well-being measure were used to assess nonlinearity, and we estimated the point on each well-being scale associated with the greatest odds of receiving an award (see Darlington & Hayes, 2017, p. 356). If the maximum occurs outside the possible 1 to 5 range on a well-being scale, the conclusions are simplified because the direction of the linear trend will apply across the entire range of possible well-being values. In cases where the maximum occurs inside the possible range, the direction of the linear trend changes at the maximum, and this necessitates a qualification of the results. To illustrate the nonlinear relation between award attainment and well-being, we plotted the predicted probabilities of award attainment across the range of possible well-being values. The linear and quadratic effects were estimated after mean-centering each well-being measure (see Darlington & Hayes, 2017, p. 355).

To further explore the data beyond the general regression reported above, we also examined whether the associations were similar across four sets of demographic categories for which we thought effects could potentially differ: education (\leq high school, $>$ high school), gender (men, women), race/ethnicity (White, Black, Hispanic), and rank (enlisted, officer) in separate analyses. We included an interaction term for PA with education, gender, race/ethnicity, and rank (separately). These two-way interaction effects were also examined for NA in separate models. Second, we ran each PA and NA model stratified by education, gender, race/ethnicity, and rank.

5 Results

5.1 Demographic Characteristics

Over the four-year follow up window, 114,443 soldiers (12.60%) received an award. The soldiers in this study were fairly young (mean age 29.60 years old; $SD=9.16$ years), and the majority were White (65.46%), male (83.24%), had a high school education or less (81.06%), and had no previous awards at baseline (86.73%). Approximately half the sample was married (49.54%), active duty (49.73%), and had deployed to a combat zone (e.g., Iraq, Afghanistan, etc.) at least once prior to baseline (54.41%). The majority of soldiers (81%) completed the full four years of follow-up. Relative to the scale midpoints (3), soldiers reported moderate PA ($M=3.75$) and optimism ($M=3.72$), and low NA ($M=2.23$).

Table 2 displays baseline characteristics by award status during follow-up. Award recipients had higher average PA scores ($d=0.159$), lower NA scores ($d=-0.166$), and higher optimism scores ($d=0.138$) than soldiers who did not receive an award. Award recipients were more likely to have received an award prior to baseline (54.59% vs. 7.31%), be in the

National Guard (66.61% vs. 24.91%), and be White (75.93% vs. 68.52%). Award recipients were more likely to be officers (17.75% vs. 14.79%), college educated (23.56% vs. 22.05%), male (85.78% vs. 82.87%) and have a longer mean follow-up time (3.94 years vs. 3.55 years).

5.2 Associations by Type of Affective Well-being

Our first set of logistic regression analyses examines the effect of eight different measures of affective well-being on subsequent award attainment. The All Awards category was the outcome variable in these analyses.

5.2.1 PA

We observed modest and statistically significant positive linear effects of general PA ($OR=1.12$, 95% CI [1.11,1.13], $p<0.001$), high arousal PA ($OR=1.11$, 95% CI [1.10, 1.12], $p<0.001$), and low arousal PA ($OR=1.09$, 95% CI [1.08, 1.11], $p<0.001$) on subsequent award attainment, after controlling for demographic and military covariates (Table 3). Statistically significant ($p<0.001$) quadratic effects were detected, but the estimated maximums for all three measures of positive affect occurred outside the range of observed well-being scores (Fig. 1). Thus, the observed positive linear effects hold across all values of the three PA measures.

5.2.2 NA

We observed modest and statistically significant negative linear effects of general NA ($OR=0.87$, 95% CI [0.86, 0.88], $p<0.001$), high arousal NA (hostility and anxiety) ($OR=0.91$, 95% CI [0.90, 0.92], $p<0.001$), and low arousal NA (sadness) ($OR=0.91$, 95% CI [0.90, 0.92], $p<0.001$) on subsequent award attainment, after controlling for demographic and military covariates (Table 3). Statistically significant ($p<0.001$) quadratic effects were detected and the estimated maximums occurred outside the range of negative affect measures except for general NA. For general NA, the maximum occurred at $NA=1.30$, with a slight increase in the odds of an award occurring between $NA=1$ and $NA=1.30$, followed by a decrease in the odds of receiving an award between $NA=1.30$ and $NA=5$ (Fig. 1).

5.2.3 Optimism

Similar to PA and NA, we observed a modest and statistically significant positive linear effect of optimism on award attainment after controlling for demographic and military covariates ($OR=1.10$, 95% CI [1.09, 1.11], $p<0.001$); see Table 3. A statistically significant ($p<0.001$) quadratic effect also was detected. The maximum occurred at optimism=4.38, such that award attainment increased between optimism values of 1 and 4.38 and then slightly decreased for optimism values of 4.38 to 5 (Fig. 1).

We also examined the unique effects of general PA, general NA, and optimism on subsequent All Awards attainment by including all three of these well-being measures as predictors in a logistic regression model. As expected, NA was inversely correlated with PA ($r=-.58$) and optimism ($r=-.53$), whereas PA was positively correlated with optimism ($r=0.58$). The unique linear effects for all three predictors remained statistically significant

Table 3 Odds ratios (95% CI) and quadratic estimates for associations between well-being and award attainment

| Well-being measure | All awards (<i>n</i> = 114,443) | | Heroism awards (<i>n</i> = 802) | | Performance awards (<i>n</i> = 113,641) | |
|--------------------|----------------------------------|----------|----------------------------------|--------|--|----------|
| | OR [95% CI] | Quad | OR [95% CI] | Quad | OR [95% CI] | Quad |
| Positive Affect | 1.12 [1.11, 1.13]*** | -0.04*** | 1.13 [1.02, 1.25]* | -0.07 | 1.12 [1.11, 1.13]*** | -0.04*** |
| High arousal PA | 1.11 [1.10, 1.12]*** | -0.03*** | 1.10 [1.00, 1.20]* | -0.03 | 1.11 [1.10, 1.12]*** | -0.03*** |
| Low arousal PA | 1.09 [1.08, 1.10]*** | -0.03*** | 1.11 [1.02, 1.21]* | -0.06 | 1.09 [1.08, 1.10]*** | -0.03*** |
| Negative affect | 0.87 [0.86, 0.88]*** | -0.07*** | 0.92 [0.82, 1.03] | -0.13* | 0.87 [0.86, 0.88]*** | -0.07*** |
| High arousal NA | | | | | | |
| Anger/hostility | 0.91 [0.90, 0.92]*** | -0.02*** | 1.05 [0.95, 1.16] | -0.06 | 0.91 [0.90, 0.92]*** | -0.02*** |
| Anxiety/worry | 0.95 [0.94, 0.96]*** | -0.02*** | 0.95 [0.87, 1.04] | 0.01 | 0.95 [0.94, 0.96]*** | -0.02*** |
| Low arousal NA | | | | | | |
| Sadness | 0.91 [0.90, 0.92]*** | -0.03*** | 0.88 [0.81, 0.96]** | -0.03 | 0.91 [0.90, 0.92]*** | -0.03*** |
| Optimism | 1.10 [1.09, 1.11]*** | -0.07*** | 1.14 [1.04, 1.26]** | -0.06 | 1.10 [1.09, 1.11]*** | -0.07*** |

All models adjust for gender, age, race/ethnicity, education level, marital status, military rank, prior deployment, Army component, military service length, prior award attainment, and follow-up length. Each well-being measure was examined in a separate model. OR = odds ratio; CI = confidence interval; Quad. = quadratic term; PA = positive affect; NA = negative affect. * $p < .05$, ** $p < .01$, *** $p < .001$

($p < 0.001$) and in the same direction as reported in Table 3: PA was associated with a 5% increase in odds of obtaining an award ($OR = 1.05$, 95% CI [1.04, 1.07]), NA was associated with an 8% decrease in odds of obtaining an award ($OR = 0.92$, 95% CI [0.91, 0.93]), and optimism was associated with a 3% increase in odds of obtaining an award ($OR = 1.03$, 95% CI [1.02, 1.04]). Statistically significant quadratic effects were detected for general PA, general NA, and optimism, however, the linear effects hold over most of the 1 to 5 range of each well-being measure.

The results in Table 3 provide important evidence of external validity. Specifically, the relation between affective well-being and award attainment can be generalized to general PA, high arousal PA, low arousal PA, general NA, high arousal NA, low arousal PA, and optimism.

5.3 Analyses by Type of Award

In the previous logistic regression analyses by type of well-being, the All Awards category was used as the outcome variable. To assess the generalizability of our findings to specific types of awards, we examined the effects of general PA, general NA, and

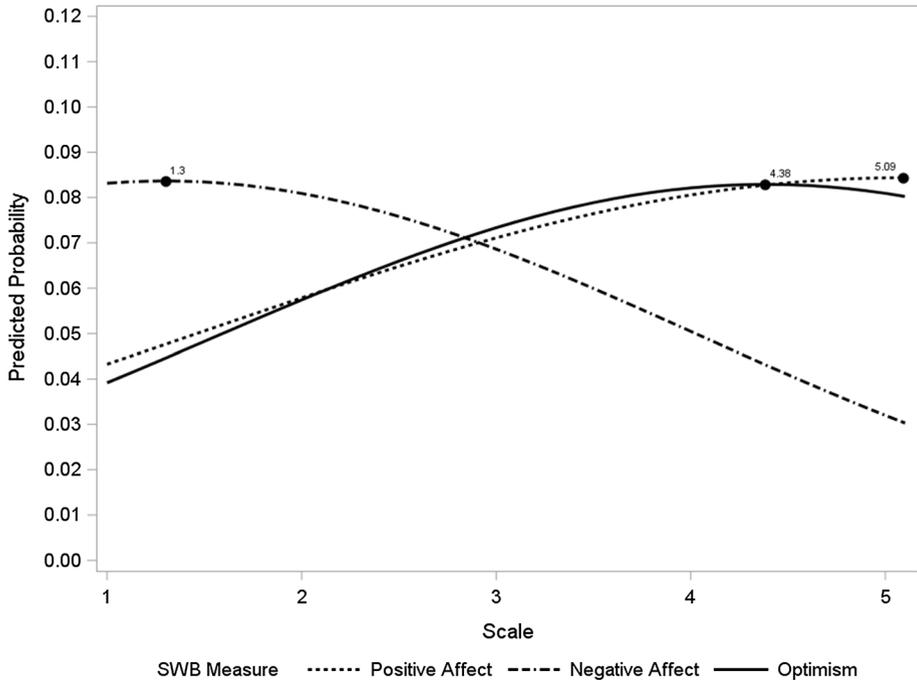


Fig. 1 Predicted Probability of Receiving an Award Based on Levels of Three Types of Well-being. Note: Numbers correspond to the scale value associated with the maximum probability of receiving an award. Probabilities are calculated for enlisted, active duty, White, married, male soldiers with a high school education or lower, with no prior deployments or awards and who were at the mean for age, service length and follow-up time

optimism on the attainment of a heroism award and the attainment of a performance award. A total of 802 heroism awards and 113,641 performance awards were received during the follow-up years. The results are summarized in Table 3.

5.3.1 Heroism Award

We observed a modest and statistically significant positive linear effect of general PA on subsequent heroism award attainment, after controlling for demographic and military covariates ($OR=1.13$, 95% CI [1.02, 1.25], $p<0.05$). We also observed a modest and statistically significant positive linear effect of optimism on subsequent heroism award attainment, after controlling for demographic and military covariates ($OR=1.14$, 95% CI [1.04, 1.26], $p<0.01$). NA was not significantly associated with receiving a heroism award.

5.3.2 Performance Award

We observed a modest and statistically significant positive linear effect of general PA on subsequent performance award attainment, after controlling for demographic and military covariates ($OR=1.12$, 95% CI [1.11, 1.13], $p<0.001$). We also observed a modest and statistically significant positive linear effect of optimism on subsequent performance award

attainment, after controlling for demographic and military covariates ($OR=1.10$, 95% CI [1.09, 1.11], $p<0.001$). We observed a modest and statistically significant negative linear effect of general NA on subsequent performance award attainment, after controlling for demographic and military covariates ($OR=0.87$, 95% CI [0.86, 0.88], $p<0.001$). Statistically significant quadratic effects for general PA, optimism, and general NA were detected, but the linear effects hold over most of the 1 to 5 range of each well-being measure.

5.4 Analyses by Demographic Subgroups

Additional analyses for All Awards were performed to assess the generality of the results reported in Table 3 across several demographic subgroups. Interaction effects were added to the logistic regression models to assess possible moderation effects of education, gender, race/ethnicity, and rank. No statistically significant interaction effects were found for rank or gender. Statistically significant but small interaction effects were detected for education and race/ethnicity.

The size of a moderation effect for a particular demographic factor can be assessed by comparing the odds ratios within each level of a demographic factor. Table 4 gives the odds ratios within each level of education, gender, race/ethnicity, and rank. As Table 4 reveals, only very small differences in odds ratios were observed within the levels of each demographic factor. For example, the largest difference in odds ratios was observed for the education factor where the relation between general PA and award attainment was slightly stronger for soldiers with high school education or less ($OR=1.14$, 95% CI [1.13, 1.15], $p<0.001$) than soldiers with more than high school education ($OR=1.07$, 95% CI [1.05,

Table 4 Odds Ratios (95% CI) and Quadratic Estimates for Associations Separately within Categories of Education, Gender, Race/Ethnicity, and Rank

| Subgroup | Positive Affect | | Negative Affect | |
|-----------------------------|----------------------|----------|----------------------|----------|
| | OR [95% CI] | Quad | OR [95% CI] | Quad |
| Education | | | | |
| Up to a high school diploma | 1.14 [1.13, 1.15]*** | -0.04*** | 0.86 [0.85, 0.87]*** | -0.08*** |
| More than high school | 1.07 [1.05, 1.10]*** | -0.03* | 0.90 [0.88, 0.92]*** | -0.05** |
| Gender | | | | |
| Male | 1.12 [1.11, 1.14]*** | -0.05*** | 0.87 [0.86, 0.88]*** | -0.08*** |
| Female | 1.11 [1.08, 1.14]*** | -0.02 | 0.90 [0.87, 0.93]*** | -0.07*** |
| Race/Ethnicity | | | | |
| Black | 1.12 [1.10, 1.15]*** | -0.04*** | 0.90 [0.87, 0.92]*** | -0.05** |
| Hispanic | 1.15 [1.11, 1.18]*** | -0.06*** | 0.85 [0.82, 0.88]*** | -0.08*** |
| White, Non-Hispanic | 1.12 [1.10, 1.13]*** | -0.04*** | 0.87 [0.86, 0.88]*** | -0.08*** |
| Rank | | | | |
| Enlisted | 1.13 [1.12, 1.14]*** | -0.04*** | 0.87 [0.86, 0.88]*** | -0.08*** |
| Officer | 1.10 [1.07, 1.13]*** | -0.04** | 0.89 [0.86, 0.92]*** | -0.05** |

All models adjust for gender, age, race/ethnicity, education level, marital status, military rank, prior deployment, Army component, military service length, prior award attainment, and follow-up length

OR odds ratio; CI confidence interval; Quad. quadratic term

* $p<.05$, ** $p<.01$, *** $p<.001$

1.10, $p < 0.05$). Our moderator analyses indicate that the basic findings reported in Table 3 for general PA and general NA can be generalized across all of the education, gender, race/ethnicity, and rank subgroups in Table 4.

The probability plots in Figs. 2 and 3 provide additional information regarding the small moderating effects of education, gender, race/ethnicity, and rank. Note that the probability curves are approximately parallel for different levels of each demographic factor.

5.5 Strength of Associations

All of the linear effects reported in Table 3 for All Awards are statistically significant at $p < 0.001$, but these small p -values are partially due to our large sample size. The odds ratios reported in Table 3 provide important information regarding the size of the effects. The odds ratios describe the change in the odds of award attainment associated with a 1-point increase in a well-being predictor variable. For example, $OR = 1.12$ for general PA in Table 3 indicates that the odds of award attainment becomes 1.12 times larger for every 1-point increase in PA.

A probability ratio is another way to describe the strength of association between a well-being measure and award attainment. For example, the probability of award attainment at PA = 5 (0.1364) is about two times larger than the probability of award attainment at PA = 1 (0.0632), and the probability of award attainment at NA = 1 (0.1374) is about two times

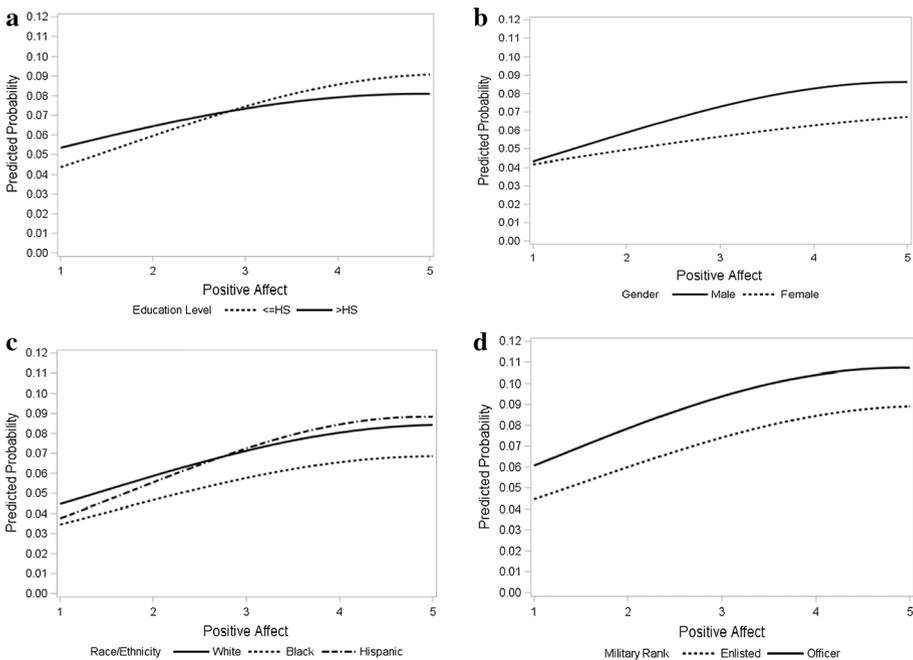


Fig. 2 Predicted probability of an award per unit increase in positive affect, by (a) education level, b gender, c race/ethnicity, and d military rank. Note: HS = high school. Probabilities were calculated at the mean for continuous covariates and at the reference category level (White, married, enlisted, active duty, male, high school education or less, no prior deployments or awards) for categorical covariates

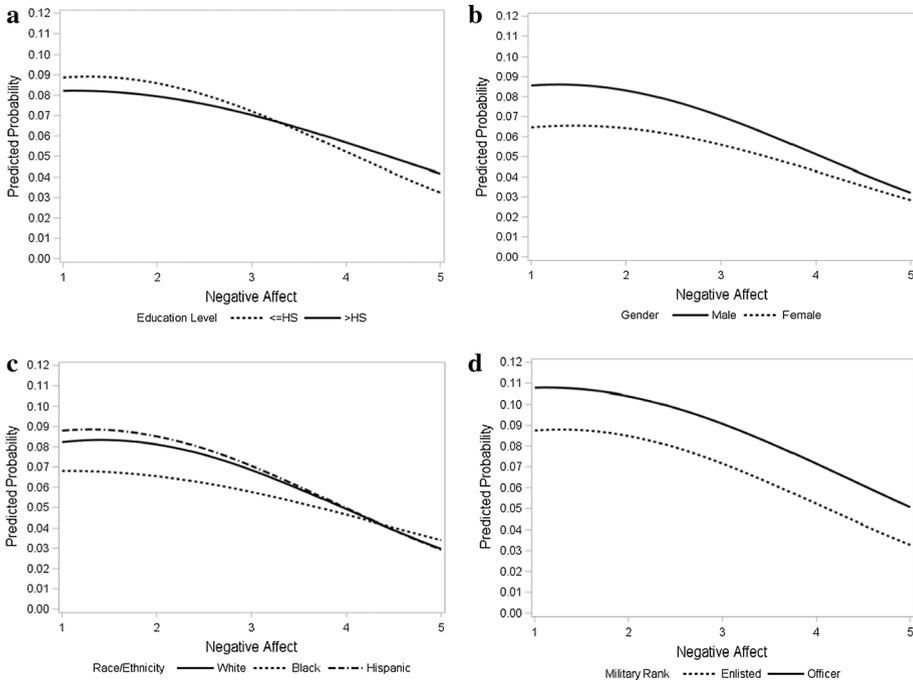


Fig. 3 Predicted probability of an award per point increase in average NA, by (a) education level, b gender, c race/ethnicity, and d military rank. Note: HS = high school. Probabilities were calculated at the mean for continuous covariates and at the reference category level (White, married, enlisted, active duty, male, high school education or less, no prior deployments or awards) for categorical covariates

larger than the probability of award attainment at NA=5 (0.0557). Given the nonlinear relation between the probability of award attainment and well-being illustrated in Fig. 1, it is also informative to assess probability ratios for low, moderate, and high values for well-being. For example, the probability of award attainment at PA=3 is about 1.64 times larger than the probability of award attainment at PA=1, while the probability of award attainment at PA=5 is about 1.19 times larger than the probability of award attainment at PA=3.

5.6 The Combined Predictive Power of PA and NA

Thus far, the findings presented have highlighted the associations between individual measures of well-being and subsequent award attainment. It is also important to examine the extent to which leveraging information about both PA and NA can enhance prediction of award attainment. Comparing the percent of soldiers who obtained an award within specified ranges of well-being measures is one way to investigate this. For example, we observed nearly a four-fold increase in the percent of soldiers who obtained an award (3.70% versus 13.78%) when comparing the unhappiest soldiers (high NA [4–5] and low PA [1–2]) to the happiest soldiers (low NA [1–1.5] and high PA [4.5–5]). This difference in award attainment between the happiest and unhappiest soldiers translates into a large difference in outstanding performance.

6 Discussion

Several clear findings emerged from our examination of well-being and award attainment in a large sample of Army personnel. First, most types of positive affective well-being, both general dimensions and discrete emotions, predicted soldiers receiving both heroism and performance awards. High PA, low NA, and optimism all uniquely predicted award attainment, as did low and high arousal PA and discrete types of NA (sadness and hostility/anger). Worry was a weak predictor. Although sadness and anger predicted fewer awards, low levels of positive emotions also did so. This indicates that it is not just high negative feelings that interfere with good performance, but that high positive feelings may boost performance as well.

The effects we found were small but highly accurate. The three well-being measures are moderately correlated and have some common overlapping associations with awards, but each of the three types of well-being significantly predicted award attainment after controlling for the other well-being measures. Thus, our results suggest that low NA, high PA, and high optimism each uniquely predict a greater odds of superior work performance, and there was almost four times as many award recipients among soldiers very high versus low in well-being. This difference is important and especially noteworthy considering that receiving an Army award was rare, with a base rate of 12.6% across over 900,000 people. High well-being was associated not only with long-term work performance, as signified by the correlation with awards for performance, but also with awards for heroism, which are based on an episode of noteworthy valor in the face of danger.

The predictive power of well-being was generalizable not only across types of well-being, but also across two different performance outcomes (performance awards and heroism awards) and a number of different populations (men and women, ethnic groups, more and less educated soldiers, and officers and enlisted soldiers). Although our sample was restricted to Army soldiers, it was very diverse in terms of ethnicity, gender, education, age, and marital status. Thus, we have demonstrated that the predictive association between well-being and good performance is not restricted to small samples of convenience. Although a few interaction effects for demographic factors were detected, these effects were very small and therefore we can make general claims regarding the predictive ability of well-being on award attainment across all of the demographic factors we examined.

Importantly, in addition to finding that well-being predicts performance, we also found that well-being most strongly predicts performance between unfavorable and moderate well-being. Within PA, for example, there was a greater increase in the probability of attaining an award between low (1) and moderate (3) PA, compared to moderate (3) and high (5) PA (1.64 vs. 1.19 times the probability of an award, respectively). Therefore, interventions targeting soldiers with low, rather than moderate, PA may yield the greatest benefit. Conversely, we observed a greater decrease in the probability of an award between high (5) and moderate (3) NA, compared to moderate (3) and low (1) NA (0.47 vs. 0.83 times the probability of receiving an award, respectively). Thus, affect is more strongly related to award attainment when going from unfavorable (i.e., low PA or high NA) to moderate affect, rather than moderate to favorable (i.e., high PA, low NA) affect. These patterns are in accord with the suggestion that occasional NA might be adaptive and functional (e.g., Kashdan & Biswas-Diener, 2014; Oishi et al., 2007), and that extremely high PA and no NA is not necessarily required for effective functioning. Thus, successful workers are substantially less likely to be unhappy individuals, but moderate happiness was sufficient in our study to produce most of the benefits.

6.1 Integration and Additional Contributions

We cannot firmly establish causality with certainty with the current data. However, the predictive temporal association of well-being with awards, with the relationships persisting in spite of a number of statistical controls of other potential explanatory variables, increases our confidence in the likelihood of the causal effect. Furthermore, many soldiers received awards who had not previously done so, and this disconfirms the explanation that it is simply positive responses to awards that predict awards only, because soldiers who earn one are more likely to earn another. However, strong confirmation of the causal influence moving from affective well-being to performance comes from other studies, recalling that the major goal of the present study was to test the generality and nature of the association, not causal direction.

Thus, it is important to consider the findings from the current study within the context of other research. In the empirical literature, there are some experimental studies that indicate causality moving from well-being to work performance (Bellet et al., 2019; Oswald et al., 2015). Beyond experimental studies, there are also longitudinal studies suggesting that well-being precedes work performance and income (Diener et al., 2002; Luhmann et al., 2012). Likewise, several studies examine the “Why?”, or more specifically the sequences within the causal relationship. For example, research shows that good work performance is often preceded by certain affective states and behaviors (De Neve et al., 2013; Diener et al., 2015; Lyubomirsky et al., 2005), such as good health (Diener et al., 2017a, 2017b; Pressman & Cohen, 2005), supportive social relationships (Diener & Seligman, 2002), creativity (Isen & Daubman, 1987), goal pursuit (Taquet et al., 2016) and prosocial behavior (Kushlev et al., 2020). Thus, a variety of affective states and behavioral characteristics help explain why happier workers tend to show better performance. Taken together, the present study thematically reinforces much of this research, and does so at scale.

One of the more significant findings in the present study is the curvilinear relationship between affective well-being and performance. Such curvilinear effects are often difficult to establish because they require very large sample sizes to establish the effects with confidence. There are theoretical reasons why the most beneficial effects of affective well-being might not occur at the highest levels of positive feelings in the absence of negative feelings. Negative emotions can be adaptive in some situations, and in some cases, are even associated with better performance (Parrott, 2014). Tamir and Ford (2012) found that people who wanted to feel more anger when it was useful reported higher well-being. Negative emotions can help people focus attention on a problem and conserve resources when needed, for example. It follows that the greatest benefits might not come from very high PA with virtually no NA. Instead, it might be that in many situations, moderate intensity affective well-being is most beneficial.

Additionally, the present study offers important methodological implications when studying the link between well-being and performance. As we have previously noted, the large sample aides in establishing effect accuracy across several demographics and work domains. Thus, the present study serves as a sampling and effects benchmark for future research.

6.2 Limitations, Future Research Directions, and Implications for Practice

While this study helps to answer several lingering questions about well-being and optimism, there are important limitations that warrant mention. As previously described, while

the longitudinal nature of the data addresses temporal concerns, and the objectivity of receiving an award negates concerns of single-source reporting bias common in psychological research, we cannot conclude from the current findings that well-being and optimism caused deserving soldiers to receive an award. At best, we can say that high levels of well-being and optimism raise the likelihood that one would receive an award. While it does not appear that the relationship between well-being and performance turns asymptotic, this may be due to range restriction in the PANAS.

Future empirical research should examine these issues and others. For example, one important area that should be more closely scrutinized is the relationship between well-being, optimism, and heroism. While it is true that our data suggest that there is a relationship between well-being, optimism, and heroism awards, we do not believe that positive emotions measured today would drive discrete heroic behavior observed a year from now. Rather, perhaps positive emotions covary with deeper psychological constructs, virtues such as courage, that may later drive heroic behavior. Or, perhaps those with a high degree of positive affect are seen in a different light by those making decisions about who is nominated for and ultimately receives a heroism award. As highlighted earlier in the paper, nominating a soldier for an award requires effort—and *significant* effort for heroism awards—which raises the possibility that leaders are willing to go the extra mile to ensure that positive and optimistic soldiers are recognized for their heroism, at least more so than soldiers who display negative emotions and are generally pessimistic.

An important practical implication of this study's findings is that organizations might consider well-being in their hiring decisions. Prescreening potential workers' well-being could help employers rule out applicants with very low well-being. Seeking very, as opposed to moderately happy workers, however, might not produce as many gains. Alternatively, enlightened companies may strive to create workplace conditions that produce happy workers. Whatever the strategies used, high well-being appears to be conducive to exemplary work performance.

7 Conclusion

The present study takes an important step forward in accurately depicting the strength of relationship between well-being, optimism, and objective performance. Likewise, it does so at scale and across several demographics, while also depicting how well-being and optimism depart from linearity when predicting performance. In sum, while there are many factors that are influential in exceptional performance within a work context, this study shows that well-being and optimism matter greatly.

Declarations

Conflicts of interest We have no conflicts of interest to disclose.

Ethical approval This research complied with all ethical standards and was approved by a university and a U.S. Army Institutional Review Board. All data used in this study were from participants who consented to allow their data to be used for research purposes.

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