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Individual and experiential predictors of character development across the deployment cycle

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Abstract

How soldiers adapt to and change in response to the deployment experience has received a great deal of attention. What predicts which soldiers are resilient and which soldiers decline in character strengths across the deployment transition? We examined this question in two analyses drawing from the same data source of soldiers deploying for the first time (Analysis 1: $N = 179{,}026$; Analysis 2: $N = 85{,}285$; $M_{age} = 24.6$–24.7 years old, $SD = 4.87$; 66.5–66.9% White). Specifically, we examined how individual (e.g. sociodemographic, military) and deployment (e.g. stressful experiences) characteristics predict character development across the deployment cycle. Character strengths were assessed once before and up to three times after soldiers' return from deployment. Reproducing previous work, we found evidence for two classes of change—a resilient class ("stable high") and a recovery class ("persistent low"). The strongest predictor of high, resilient character strength levels was better self-rated health at baseline. The findings are discussed in the context of the mechanisms that drive character development, evidence for post-traumatic growth, and practical implications for the U.S. Army.

Keywords

Character strengths, growth mixture modeling, U.S. Army soldiers, resilience, character development

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How soldiers adapt to and change in response to the deployment experience has received a great deal of attention (Bonanno, Mancini, et al., 2012; Porter et al., 2017; Rodin et al., 2017; Tedeschi & McNally, 2011; Zamorski & Britt, 2011). As might be expected, there are individual differences in how soldiers change in their *character strengths* (i.e. elements of positive or socially admired personality traits) before to after a deployment (Chopik et al., 2021). Some soldiers are relatively unchanged, displaying high degrees of resilience in character strengths across the deployment cycle. Other soldiers experience long-lasting decreases in their character strengths across the deployment cycle. But what predicts which soldiers are resilient and which soldiers decline in character strengths across the deployment transition? Relatively few studies have information on the characteristics of soldiers (i.e. sociodemographic) before and details about challenging experiences (e.g. combat stress) during the deployment cycle (e.g. Bonanno, Mancini, et al., 2012). In fact, in broader longitudinal studies of how individuals adapt to potentially challenging life circumstances, there are very few specific questions asked about the potentially challenging life circumstances altogether (Jayawickreme et al., 2021; Luhmann et al., 2021). In the two analyses presented here, we examined how individual (e.g. sociodemographic, military) and deployment (e.g. stressful experiences) characteristics predict character development across the deployment cycle.

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Post-traumatic growth, resilience, and positive personality change

The concepts of resilience and post-traumatic growth have been used to characterize many different phenomena—including rebounds following an adverse event, positive outcomes and change despite challenging circumstances, and positive reflections and perspectives on how an individual's life has changed following adversity (Infurna & Jayawickreme, 2019; Masten et al., 1990). In some of the more recent theoretical models outlining growth and resilience, several mechanisms for how and why people persist in the face of adversity have been put forth; for many of these models, adversity is championed as one of the key reasons why positive psychological change is possible (Tedeschi & Calhoun, 2004). The idea is that adversity requires people to critically evaluate aspects of their daily lives and identities and adjust accordingly given new circumstances or perspectives (Jayawickreme et al., 2021). Such proposals can also be found in the broader personality change literature as well (Hennecke et al., 2014; Roberts & Nickel, 2017; Specht et al., 2014). From this basic premise stems a great deal of complexity—that the onset of (some forms of) adversity is not randomly distributed throughout the population, that adversity can be characterized using multiple dimensions, and that active reflection on adversity might alter its effects on individuals (Grossmann et al., 2016; Jayawickreme et al., 2021; Luhmann et al., 2021). This complexity is also detailed in stage-like models of growth and resilience. For example, in Tedeschi and McNally (2011)'s model of post-traumatic growth among combat veterans, they suggest that, in order to grow from the adversity experienced from deployments, soldiers must reframe the adversity in healthy ways, develop a narrative around adversity, and engage in critical self-reflection. Together, the progression through these stages is hypothesized to be the building blocks of growth and resilience.

The idea that people can be resilient or even grow from adversity is inherently appealing to many, despite a general lack of robust evidence supporting it (Jayawickreme & Blackie, 2016a, 2016b). Although the aforementioned theoretical models have done an admirable job of trying to lay out some of the preconditions for growth and resilience, the literature is also rife with many methodological limitations that have limited the study of these topics (Frazier et al., 2009; Infurna & Jayawickreme, 2019; Infurna & Luthar, 2016; Jayawickreme et al., 2021; Tennen & Affleck, 2009). Chief among these reasons is a lack of prospective, longitudinal data of a group of individuals followed before to after an adverse event. Of course, it is very difficult to collect pre-adversity data—we do not always know when adversity strikes. However, using a structured form of adversity such as an Army deployment might provide a natural setting to examine how common growth and resilience is in the face of potential adversity. The deployment cycle has many forms of potential adversity. For example, soldiers who deploy spend large amount of time away from the support systems (e.g. families) and often find themselves in unfamiliar situations with the potential for danger.

Examining how soldiers psychologically change across the transition would provide valuable descriptive information on not only how common resilience and growth are, but also the predictors of psychological changes following adversity. Knowing this information can inform the aforementioned theoretical models of growth and resilience. Specifically, this descriptive information can help either confirm some of the basic assumptions of these models or provide some direction into how these models may be revised moving forward. Importantly, it can provide substantive information about how soldiers' *character* changes following the deployment cycle. Examining character strengths specifically can shift the focus from ostensibly maladaptive characteristics (e.g. depressive symptoms, post-traumatic stress disorder (PTSD)) to a truly positive personality and growth framework. To provide conceptual clarity given the many different descriptive patterns that have been used to characterize growth and resilience, the current study considers someone to be resilient if they maintain their levels of character across the deployment transition. This operationalization closely mirrors others in the literature, particularly those pertaining to how well-being and psychological adjustment change following adversity (Infurna & Luthar, 2016); we acknowledge that there are other definitions of resilience in the literature (Infurna & Jayawickreme, 2019). The presence of post-traumatic growth was operationalized as an identifiable group of soldiers who shift toward higher levels of character following the deployment transition. We elected to use this definition because it represented positive changes from pre-deployment characteristics and resembled the definition similar studies examining post-traumatic growth have used (Chopik, 2018, 2021; Hoerger et al., 2014).

Character change across the deployment cycle

To date, almost all research on how soldiers change across the deployment transition has been limited to indicators of PTSD and depressive symptoms (Galatzer-Levy et al., 2018). Although theoretical models that bring about resilience and growth in other characteristics have been developed (Tedeschi & Calhoun, 1996, 2004; Tedeschi & McNally, 2011), evidence from prospective longitudinal studies has lagged behind these developments. Indeed, when examining changes in psychological characteristics among individuals experiencing adversity, researchers often find relatively few changes or changes

suggesting *decrements* in psychological functioning (Infurna & Jayawickreme, 2019). Further, very few studies have examined changes in positive psychological characteristics. Do individuals become wiser after experiencing a challenging life event? Do they become interpersonally warmer toward their loved ones or open to the possibilities of life after experiencing some of life's most challenging circumstances? Recent research and reviews suggest that people may not change in such consistent ways following important life events (Bleidorn et al., 2018).

In the largest prospective study of character strength changes to date, Chopik et al. (2021) found that the majority of soldiers (63%) do not substantially change in their character strengths from 6-months before deployment to 2.5 years after the deployment. It is worth noting that soldiers who experienced any type of change actually experienced *declines* in intellect, civic strengths, warmth, and temperance. The largest declines in these strengths among soldiers occurred from before to after the deployment. Importantly, soldiers who experienced declines in each of these strengths never fully recovered to their pre-deployment levels of the character strengths—the compromised character strengths were still lower two years after these initial declines occurred. When taken together with similar negative outcomes (e.g. PTSD), these decrements in character strengths highlight yet another psychological cost of war.

Because the declines in character strengths appear to be somewhat persistent, a natural question is what distinguishes soldiers who are resilient and those who experience these persistent declines.[1] Knowing the factors that drive such changes can help identify the soldiers most at risk for developing long-term negative outcomes following the deployment transition. This is particularly important because of the many associations between character strengths, health, and well-being across the life span (Proctor et al., 2011; Proyer et al., 2013).

But what are the factors that might lead to stability or decline in character strengths? In the current study, we examined factors that were specific to soldiers (e.g. rank, mental status) and the deployment experience (e.g. stressors, injury). In the sections below, we describe some speculative reasons why these characteristics might predict character development across the deployment transition.

Predictors of character strength development

To date, many of the predictors of the development of psychological characteristics during a potentially stressful event have been categorized in two ways—*individual characteristics* that are present prior to an event and *environmental characteristics* present either during or following the potentially stressful event. In the current study, we highlight the specific characteristics we chose to examine in the current study. The selection of these characteristics was based on previous research and was decided a priori, although ultimately the research described here was not formally pre-registered.

Individual characteristics present for soldiers *prior to* the deployment experience that might affect their adjustment *after* the deployment transition ranged from demographic characteristics (i.e. age, sex, education, race/ethnicity), to military characteristics (i.e. component (active duty, Reserve, or National Guard), rank, time in service), to health characteristics (i.e. self-rated health, history of psychiatric treatment). Each of these pre-existing characteristics had been previously linked to adaptation following stressful events. For example, highly educated soldiers had consistently fewer PTSD symptoms compared to those with lower levels of education. Soldiers with lower levels of education were more likely to experience increasing or higher levels of PTSD symptoms following deployment (Bonanno, Mancini, et al., 2012). Likewise, those with better self-rated health and less psychopathology are also more likely to be considered resilient across stressful transitions (Bonanno et al., 2002; Burton et al., 2015). Soldiers with a higher rank and those in service branches were less likely to be exposed to direct conflict also exhibited lower PTSD symptoms across the deployment transition (Bonanno, Mancini, et al., 2012).

A proliferation of studies seeking to characterize changes in psychological functioning across the deployment cycle has emerged over the last decade (Andersen et al., 2014; Berntsen et al., 2012; Boasso et al., 2015; Dickstein et al., 2010; Eekhout et al., 2016; Karstoft et al., 2013; Nash et al., 2015; Orcutt et al., 2004). Yet, with the exception of Chopik et al. (2021), no studies have examined changes in psychological characteristics across the deployment transition other than PTSD symptoms (Galatzer-Levy et al., 2018). Other work has examined military populations and the effects that training has on personality trait development (Jackson et al., 2012). However, studies of psychological changes outside of maladaptive characteristics are rare. Studies of the deployment transition have focused on the role of combat stressors in predicting membership in classes of soldiers that show increases in PTSD. But do combat stressors predict the development of other characteristics, such as character strengths?

In theories and research positing the existence of post-traumatic growth, one inherent assumption is that an individual needs to be exposed to an adverse event that changes their thoughts, feelings, and behavior in some way (Infurna & Jayawickreme, 2019; Jayawickreme & Blackie, 2014, 2016b). In the Chopik et al. (2021) study, the majority of soldiers do not significantly change in their character strengths, suggesting that the average deployment experience might not contain the ingredients necessary to cultivate character development. However, formally

examining soldiers' experiences and how they relate to character development is important. Psychological characteristics often predict the incidence and perception of stressful circumstances, which may in turn drive character development (Kitayama et al., 2018; Roberts et al., 2007). It is thus possible that lower levels of various character strengths could also be associated with more stressful deployment experiences—whether lower levels predict the incidence of or adaptation to these experiences. Nevertheless, the degree to which deployment experiences predict character development across the deployment transition has not been formally examined. In Analysis 2, we created an index of combat stress that is similar to other investigations (Bonanno, Mancini, et al., 2012). We also took note of whether a soldier was injured during their deployment as this has historically predicted poorer adaptation in the context of other adverse events (Bonanno, Kennedy, et al., 2012). We then used these measures of combat stressors and injuries to predict character development across the transition. Based on previous research showing that these experiences tended to predict worse PTSD symptoms and depression, we expected that combat stressors and injuries would be associated with a lower likelihood of being classified as resilient.

The current study

In the current study, we examined how soldier characteristics prior to (Analysis 1) and experiences during (Analysis 2) the deployment predicted changes in character strengths. The analyses were split into two analyses in order to maximize the number of participants and the consistency in the analyses across the two subsamples; the two analyses use the same data sources and differences in the subsample analyses (e.g. Analysis 2) are noted below.

Specifically, in the current study, we sought to examine if there were reliable subgroups of soldiers who experienced growth, resilience, or decline in character strengths across the deployment transition. To do so, we adopted a growth mixture modeling approach—a technique that seeks to identify different trajectories of change in a variable within a broader sample (Infurna et al., 2016; Infurna & Grimm, 2017; Infurna & Luthar, 2016; Muthén & Muthén, 2000). This approach allows for the possibility that one group of individuals may begin high on some character dimension (e.g. warmth), decline across the deployment cycle, and then rebound to a moderate level. Likewise, another group may start low in a characteristic and then increase across the deployment cycle. Permitting multiple growth trajectories is an advantage over other models that have been traditionally used to model longitudinal data (e.g. growth curve modeling) that assume the sample under study develops in one particular trajectory over time, from which individuals can vary with where they start (an intercept) and change over time (slope).[2]

Because we applied the same sample criteria as the Chopik et al. (2021) paper, we expected to reproduce the pattern of character development using growth mixture modeling—that is, the majority of soldiers would be resilient and a smaller number of soldiers would experience declines that appear to be chronically stable across time (Chopik et al., 2021). Based on similar work examining demographic characteristics of individuals prior to a potentially stressful event, we expected those with higher ranks and higher levels of education to be high and stable in their character strengths across the deployment. We also expected those with worse mental and physical health to have lower character strength levels across the deployment transition. Finally, we expected more stressful deployment experiences (e.g. those with more stressors, more injuries, and longer deployments) to be associated with lower levels of character strengths across the deployment. Given the conflicting findings of some characteristics in past work predicting resilience from other characteristics (e.g. age), we treated all other tests as exploratory.

These hypotheses and analyses were not preregistered.

Analysis 1 overview and differences from Chopik et al. (2021)

This study is a follow-up to and partial re-analysis of Chopik et al. (2021). Previously, we examined trajectories of character strengths across the deployment cycle using growth mixture modeling. Based on the classes of change that emerge from the growth mixture modeling, logistic regressions were used to examine pre-deployment predictors of class membership based on character strength changes from before to after deployments (i.e. consistently high vs. moderate).

To be transparent, major portions of these data were reported in Chopik et al. (2021), but the current analysis introduced predictors of disparate trajectories of resilience and changes in character strengths and psychological characteristics, an approach adopted in previous research (Burton et al., 2015; Infurna & Luthar, 2017). The starkest difference between the two studies is the inclusion of baseline (e.g. demographic, military, and health) characteristics in predicting character development across the deployment cycle. As a result, this re-analysis was restricted to those individuals for whom we had baseline characteristics prior to deployment. This subset of the data used in Chopik et al. (2021) was used to (a) create new classifications of character change and (b) examine baseline predictors of character development, which was not undertaken in Chopik et al. (2021). Analysis 2 further extends Chopik et al. (2021) by examining retrospective reports of

deployment experiences to more carefully delineate how these experiences are related to character development. Chopik et al. (2021) was largely agnostic to the precipitating factors (either measured before or after the deployment) that might facilitate character change. The two analysis presented here redress this limitation.

Method

Sample selection procedures. For this analysis, we had access to a sample of 179,026 Army soldiers (including active duty, Reserve, and National Guard) who were deploying for the first time, completed at least one Global Assessment Tool (GAT: a broader survey instrument that included a character strengths measure) survey within a year of their deployment (before or after). The measure of character strengths was embedded inside the larger GAT.

Soldiers indicated through an electronic "opt-in" procedure that their responses could be used for research purposes. Up to two additional post-deployment surveys (9–15 months following the preceding survey and prior to a subsequent deployment) were included, when available (for up to three total post-deployment surveys). Inclusion in this study was also limited to soldiers who joined the Army the date the study began or later, had a valid age value at entry, served at least 6 weeks prior to deployment, and deployed for a maximum of 15 months. These inclusion criteria were chosen for several reasons: we did not include soldiers deployed prior to the start of the study (because we needed pre-deployment characteristics and character strengths); soldiers needed to have a valid age to determine eligibility for deployment and the study; and the range of deployment dates was set based on modal and common deployment lengths (i.e. very few deployments were shorter than 6 weeks, and there are administrative restrictions on deployments lasting longer than 15 months, making longer deployments uncommon). The University of Pennsylvania Institutional Review Board and a Department of Defense Human Research Protection Official approved this study. We included all possible data, and the sample size was determined based on using the greatest number of soldiers' data available.

Measures

Character. To assess character, soldiers completed the 24-item Abbreviated Character Strengths Test (ACST), which was adapted from the Values in Action Inventory of Strengths (VIA-IS; Peterson et al., 2011; Peterson & Seligman, 2004), an instrument embedded within the larger GAT.[3] The measure consists of 24 single-item indicators (one for each of the 24 character strengths), although the measure was substantially revised over the years. Soldiers were asked to respond to the character strength questions based on their behaviors in the preceding four weeks. Items were presented on an 11-point response scale ranging from 0 (*never*) to 10 (*always*) and recoded to range from 0 to 5 for the present analyses. The Army has a policy of converting the character strengths measure to be 0–5 (effectively dividing the scores by 2) prior to researcher access to aid in interpretability and put the scaling on par with the other psychological constructs. This was also done with the foresight that one unit of change on such a granular scale would be less meaningful or interpretable compared to the 0–5 scale.

Based on initial validation of the character measure (Vie et al., 2016), and the loss of two items of interest during a subsequent revision to the survey, we included 16 character items in this study to maintain a consistent set of items over time. More specifically, six items were excluded because of their high cross-loadings on multiple character strength factors (Vie et al., 2016), and two items (from the warmth subscale specifically) were excluded due to their content overlap with other questions on the broader survey. Because we were interested in character change over time, we restricted our analysis to soldiers who had responses for the common set of items.

We aggregated across all of these strengths to yield four subscales (and an overall composite) that were identified in the aforementioned factor analysis of the ACST measure (Vie et al., 2016). Across the deployment cycle, we examined *overall character* (a composite measure averaging all 16 items; $\alpha = .94$–$.96$), as well as four previously validated character subscales (Vie et al., 2016): *intellect* (5 items (creativity, curiosity, critical thinking, love of learning, perspective/wisdom), $\alpha = .88$–$.92$), *civic strengths* (4 items (honesty, teamwork, fairness, leadership), $\alpha = .85$–$.89$), *warmth* (3 items (love/closeness with others, kindness, gratitude), $\alpha = .80$–$.86$), and *temperance* (4 items (forgiveness, modesty, prudence/caution, self-control), $\alpha = .84$–$.87$).

This abbreviated version of the ACST correlated robustly with longer measures of character strengths (e.g. warmth and gratitude; $rs > .66$), showed invariance across demographic characteristics, and demonstrated convergent validity with other characteristics, suggesting that this short, face-valid character strength measure was likely appropriate for use (Chopik et al., 2017; Vie et al., 2016). We felt justified using an "overall" composite of character (i.e. an average of all 16 items) given the high correlations between the subscales within each time point ($rs = .65$–$.81$).

Demographic characteristics. Demographic characteristics near the beginning of each soldier's deployment were obtained from Defense Manpower Data Center (DMDC) Master Personnel Files, which contain soldiers' demographic and military information. Age was scaled in years and accurate to the nearest month. Education was classified as either high

school graduate or less versus some college or more ($N_{missing} = 726$). Race/ethnicity was classified as non-Hispanic White versus other ($N_{missing} = 673$). We also examined sex (male vs. female; no missing data on this variable).

Military characteristics. Military characteristics were primarily obtained from DMDC Master Personnel Files. Analyses included component (i.e. active duty, Reserve, or National Guard), rank (i.e. enlisted vs. officer), and time in service at the time of deployment (measured in years and accurate to the nearest day). In addition, deployment dates were obtained from the DMDC Contingency Tracking System Deployment File, which logs soldiers' departures and returns from their deployments. We observed no missing data on the military characteristic variables.

Health characteristics. Baseline health measures were obtained from the Periodic Health Assessment, a health exam soldiers complete annually. Self-rated health was assessed via a single question ("Overall, how would you rate your health during the past month?"), and possible responses were "Excellent," "Very Good," "Good," "Fair," and "Poor." Psychiatric treatment was assessed with the following yes/no question: "In the PAST YEAR, did you receive care for a mental health condition or concern such as but not limited to PTSD, depression, anxiety disorder, alcohol abuse, or substance abuse?" We observed 10,874 missing responses (for self-rated health) and 10,873 missing responses (for psychiatric treatment) on these items, respectively.

Model testing strategy

Growth mixture modeling was performed using MPlus Version 7.11 (Muthén & Muthén, 1998–2012). Soldiers were classified based on character across up to four time points (one pre-deployment time point and up to three post-deployment time points). We modeled one slope from pre-deployment to the average across the post-deployment time points and a second linear slope across the three post-deployment time points. We constrained the post-deployment slope to linearity, to aid in the model convergence. A comparison of the trajectories in the free (i.e. data-defined change) and linear models revealed very small differences (See Supplement for further details). We tested one-, two-, and three-class solutions for the overall character measure (given the moderate correlation between character subscales) and the separate character subscales that we computed from the 16 individual character items (intellect, civic strengths, warmth, temperance); we used Akaike's information criteria (AIC), Bayesian information criteria (BIC), sample-size adjusted BIC, bootstrapped likelihood ratio tests (BLRT), and entropy to assess model fit (along with the interpretability of classes). For additional details regarding the modeling specifications and resulting latent classes, please see Chopik et al. (2021) and the Supplement. Output files are available at the OSF site affiliated with this project (https://osf.io/89xvk).

Descriptive analyses and logistic regression analyses examining all predictors (modeled simultaneously) of class membership were performed in SAS Enterprise Edition 7.1. All analyses were performed within the Person-Event Data Environment (PDE), a secure virtual Army data repository and analysis environment (Vie et al., 2013, 2015).

Data accessibility statement

Due to the security and sensitivity of the data and the proprietary nature of the measures for Analyses 1 and 2, they could not be made publicly available. However, researchers interested in additional analyses or reproducing the results can contact any of the first three authors. Further, we have made analysis scripts available for reproduction purposes via our OSF page (https://osf.io/89xvk).

Results

Sample characteristics. In our sample of 179,026 soldiers, the average age was 24.6 years old ($SD = 4.87$). The sample was predominantly male (86.8%), non-Hispanic White (66.9%), enlisted (91.4%), and had a high school education or less (78.5%). Additionally, soldiers tended to belong to the active duty component (72.4%), rather than the Reserve (9.3%) or National Guard (18.3%) components. On average, soldiers had been in the Army for 2.6 years at the time of their first deployment. Prior to deployment, soldiers rated their health as 4.3 out of 5, on average, and 3.1% reported receiving psychiatric treatment within the past year.

Character across the deployment cycle. As seen in the supplementary materials, we assessed the fit of one-, two-, and three-class models. Again, we considered AIC, BIC, sample-size adjusted BIC, BLRT, and entropy, along with the interpretability of the classes, for model selection (Jung & Wickrama, 2007; Nylund et al., 2007; Ram & Grimm, 2009). Model fit statistics significantly improved between the one- and two-class models; however, a comparison between the two- and three-class models revealed only modest improvement in model fit. Additionally, the three-class model produced two classes that were fairly indistinguishable and in some instances even overlap (see Figures S1 and S2). For these reasons, we determined that two latent classes fit the data best (reproducing what was found in Chopik et al., 2021).

The first class was a "resilient" or stable high class, which maintained high character from pre-deployment through approximately three years

post-deployment. The percentage of soldiers assigned to the resilient class varied by character measure and ranged from 50% to 62% (Table 1). The second class was a declining, "persistent low" class, which had lower initial values in character strengths, had a larger initial decline, and then remained fairly flat following deployment. Character subscale measures mostly yielded similar results, although post-deployment slopes did vary some (e.g. soldiers in the persistent low class showed continuous decline in warmth across the study window).[4]

Demographic predictors of group membership. We examined predictors of group membership by entering all variables simultaneously to predict membership in the overall character resilient class. Although we entered all the predictors simultaneously, we discuss the predictors with respect to demographic, military, and health predictors of class membership.

In the overall character analysis, higher age, being male, having more education, and being non-White were each associated with a greater odds of being in the resilient class. For each successive decade in age, odds of membership in the overall character resilient class increased by almost 40% ($OR = 1.38$, 95% CI = 1.34–1.42). Character subscale measures also consistently demonstrated a significant positive association between age and resilience, with 19% to 48% increased odds of membership in the resilience class for each decade (Table 2). Relative to females, males had 13% greater odds of membership in the resilient class in the overall character analysis ($OR = 1.13$, 95% CI = 1.09–1.16). The relationship between sex and resilience demonstrated a similar pattern of associations across subscale measures, and aside from the warmth analysis, associations between sex and class membership were statistically significant at $p < .001$ (Table 2). Higher levels of education were associated with 15% increased odds of being assigned to the resilient class in the overall character analysis ($OR = 1.15$, 95% CI = 1.11–1.19). We observed a similar statistically significant association between education and resilience in the intellect and temperance subscale analyses ($p < .001$), but less pronounced in the civic strengths ($p < .01$) or not present in the warmth ($p > .05$) subscale analyses (Table 2). Non-Hispanic White soldiers had a 24% lower odds of being in the resilient class, compared to soldiers of other racial and ethnic groups ($OR = 0.76$, 95% CI = 0.75–0.78), and this pattern of association was observed across all character subscales (Table 2).

Military predictors of group membership. Officers had a 30% greater odds of being assigned to the overall character resilient class, compared to enlisted soldiers ($OR = 1.30$, 95% CI = 1.24–1.37). This association was observed in the intellect and temperance subscales, but not in the civic strengths or warmth subscales ($p > .05$). Reserve and National Guard soldiers had a 60% and 55% greater odds of being assigned to the resilient class, respectively, relative to active duty soldiers ($OR = 1.60$, 95% CI = 1.53–1.66; $OR = 1.55$. 95%, CI = 1.50–1.60), and this pattern of association held across all subscale analyses (Table 2). Lastly, time in service was not significantly associated with class membership in the overall character analysis, or in the warmth or temperance subscale analyses ($p > .05$; Table 2). Time in service did, however, demonstrate modest positive associations with resilient class membership in the intellect and civic strengths analyses ($OR = 1.02$, 95% CI = 1.01–1.02 and $OR = 1.02$, 95% CI = 1.01–1.02, respectively).

Table 1. Character change across the deployment cycle (Analysis 1).

Analysis	Percent in class	Mean predicted probability	Pre-deployment	Post-deployment 1	Post-deployment 2	Post-deployment 3
Resilient						
Overall character	62.44%	0.82	4.38	4.35	4.37	4.39
Intellect	56.72%	0.80	4.33	4.31	4.35	4.38
Civic strengths	57.93%	0.83	4.56	4.55	4.57	4.59
Warmth	58.93%	0.83	4.61	4.59	4.60	4.61
Temperance	50.23%	0.74	4.46	4.44	4.45	4.46
Persistent low						
Overall character	37.56%	0.86	3.66	3.43	3.43	3.43
Intellect	43.28%	0.85	3.51	3.26	3.31	3.36
Civic strengths	42.07%	0.89	3.77	3.57	3.61	3.65
Warmth	41.08%	0.91	3.79	3.57	3.53	3.49
Temperance	49.77%	0.88	3.59	3.43	3.47	3.51

Analysis column refers to the character strength composite scale under study for that particular analysis—intellect (a composite of creativity, curiosity, critical thinking, love of learning, perspective/wisdom), civic strengths (honesty, teamwork, fairness, leadership), warmth (love/closeness with others, kindness, gratitude), and temperance (forgiveness, mercy, prudence/caution, self-control). Given the moderate to high correlations between each character strength subscale, we also created an "overall character" composite by averaging all the individual character strength items together. See the supplementary materials for model selection results and fit statistics from the growth mixture modeling analyses. Values for the character scores at pre-deployment, post-deployment 1, post-deployment 2, and post-deployment 3 (the four right-most columns) are the means of each character strength at each wave, separated by class.

Table 2. Logistic regression model results for Analysis 1.

	Overall character		Intellect		Civic strengths		Warmth		Temperance	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age (in Decades)	1.380**	1.342–1.418	1.291**	1.259–1.324	1.481**	1.443–1.520	1.189**	1.159–1.219	1.479**	1.443–1.516
Sex (Ref: Female)	1.127**	1.092–1.163	1.180**	1.145–1.216	1.157**	1.123–1.192	0.956*	0.927–0.986	1.076**	1.045–1.108
Education (Ref: HS)	1.146**	1.108–1.186	1.257**	1.217–1.298	1.055*	1.021–1.090	0.998	0.966–1.030	1.110**	1.077–1.145
Race/Ethnicity (Ref: non-White)	0.763**	0.746–0.781	0.817**	0.799–0.835	0.789**	0.772–0.806	0.726**	0.710–0.742	0.690**	0.676–0.705
Rank (Ref: Enlisted)	1.301**	1.236–1.370	1.250**	1.192–1.311	1.221**	1.165–1.281	1.044	0.997–1.093	1.037	0.993–1.084
Component (Reserve to AD)	1.596**	1.532–1.663	1.591**	1.531–1.653	1.422**	1.369–1.478	1.559**	1.500–1.621	1.373**	1.324–1.423
Component (Guard to AD)	1.552**	1.505–1.600	1.477**	1.435–1.520	1.459**	1.418–1.502	1.577**	1.532–1.624	1.324**	1.289–1.361
Years in service	1.004	0.997–1.010	1.018**	1.011–1.024	1.017**	1.011–1.023	0.997	0.991–1.003	0.999	0.994–1.005
Self-rated health	1.659**	1.635–1.682	1.634**	1.612–1.656	1.656**	1.634–1.679	1.570**	1.549–1.591	1.544**	1.523–1.564
Mental health treatment	0.629**	0.593–0.668	0.673**	0.635–0.712	0.642**	0.605–0.680	0.682**	0.645–0.722	0.694**	0.655–0.737

HS: high school; AD: active duty.
The top row refers to the character strength composite scale under study for that particular analysis—intellect (a composite of creativity, curiosity, critical thinking, love of learning, perspective/wisdom), civic strengths (honesty, teamwork, fairness, leadership), warmth (love/closeness with others, kindness, gratitude), and temperance (forgiveness, mercy, prudence/caution, self-control). Given the moderate to high correlations between each character strength subscale, we also created an "overall character" composite by averaging all the individual character strength items together.
*$p < .01$. **$p < .001$.

Health predictors of group membership. Better self-rated health and lack of psychiatric treatment in the year prior to deployment both predicted greater odds of belonging to the resilient class. We observed a 66% greater odds of membership in the overall character resilient class per one-unit increase in self-rated health ($OR = 1.66$, 95% CI = 1.64–1.68). We also observed a similar pattern of associations between self-rated health and resilient class membership in each of the character subscale analyses (Table 2). Conversely, reporting psychiatric treatment in the previous year was associated with a 37% lower odds of being in the resilient class in the overall character analysis ($OR = 0.63$, 95% CI = 0.59–0.67). This negative association between psychiatric treatment and resilient class membership was also observed across character subscales (Table 2).

Analysis 1 brief discussion

In Analysis 1, we reproduced the two-class (i.e. resilient and persistent low) solution of Chopik et al. (2021) and also examined demographic, military, and health predictors of class membership. Being older, male, more educated, non-White, an officer, in the Reserve or National Guard, in the service for longer, healthier, and not treated for a psychiatric problem were associated with a higher likelihood of being classified in the resilient group. Although all of the variables examined significantly predicted class membership in either overall character or a subscale, they did so to varying degrees. Specifically, the largest predictor (in terms of classification accuracy; see Supplement) was self-rated physical health at baseline, followed by component (active duty, Reserve, or National Guard) and age. The smallest predictors were years in service (which was only intermittently significant), sex, education, race/ethnicity, and history of receiving mental health treatment. The significance and direction of many of the effects were consistent with other reports examining predictors of resilience in other psychological characteristics (Galatzer-Levy et al., 2018).

Analysis 1 provided an initial examination into how factors present *prior* to a deployment affect character development across the deployment transition. In Analysis 2, we turned our attention to retrospective reports of experiences provided by soldiers shortly after their deployment. We reported the findings of Analyses 1 and 2 separately because deployment information (and thus how deployment experiences affected post-deployment character) was only available for a subset of soldiers. Nevertheless, the demographic, military, and health predictors of Analysis 1 were retained for Analysis 2 in order to examine the effects of deployment experiences above and beyond the influence of the characteristics explored in Analysis 1.

Analysis 2 overview

In this analysis, we expanded our breadth of predictors to also include the role of deployment experiences in character development across the deployment cycle. In order to examine deployment experiences, we made two notable changes to the design from Analysis 1. First, we removed the pre-deployment time point from the analysis so that deployment experiences would not be predicting something that preceded them in time (e.g. combat injury predicting character prior to deployment). Second, we limited our analysis to a subset of soldiers from Analysis 1 who provided additional information required for this analysis (see below).

Method

Sample selection. For this analysis, we examined a subset of the soldiers from the Analysis 1 sample who completed one or more eligible survey after their deployment (needed to assess character following deployment) and who completed a Post-Deployment Health Assessment (the source of the combat injury and combat intensity data). These additional gating criteria resulted in an analytic sample of 85,285 active duty, Reserve, and National Guard Army soldiers for Analysis 2.

Measures

Character. As with Analysis 1, Analysis 2 examined a subset of character strengths items from the same survey (VIA-IS; Peterson et al., 2011; Peterson & Seligman, 2004). We again examined overall character ($\alpha = .96$–$.96$), as well as four previously validated character subscales: intellect (5 items, $\alpha = .92$–$.92$), civic strengths (4 items, $\alpha = .88$–$.89$), warmth (3 items, $\alpha = .85$–$.85$), and temperance (4 items, $\alpha = .86$–$.87$).

Demographic, military, and health characteristics. All of the measures examined in Analysis 1 demonstrated statistically significant associations with class membership in at least one analysis and were thus retained in Analysis 2. These included age, sex, education, race/ethnicity, rank, component, time in service, self-rated health, and psychiatric treatment in the year preceding deployment.

Deployment experiences. In Analysis 2, we also considered three measures of the deployment experience: injury during deployment, combat stress, and deployment length.

Injury during deployment was based on two items from the Post Deployment Health Assessment (PDHA), a questionnaire soldiers complete upon their return from a deployment. Soldiers were classified as having been injured while deployed if they responded affirmatively to either of the following questions: "Were you wounded, injured, assaulted or otherwise hurt during deployment?" and "During your deployment, did any of the following events happen to you?" to which soldiers could nominate the option "fragment wound or bullet wound."

For the combat stress measure, we culled the first three items directly from the PDHA: (1) "Did you ever feel like you were in great danger of being killed?" (Yes/No); (2) "Did you encounter dead bodies or see people killed or wounded during this deployment?" (Yes/No); and (3) "Did you engage in direct combat where you discharged a weapon?" (Yes/No). Additionally, we created a fourth item which combined responses from two items on the PDHA in order to capture whether a soldier reported experiencing a "Blast or explosion (e.g. IED, RPG, EFP, land mine, grenade, etc.)" or a "Vehicular accident/crash (any vehicle including aircraft)" while deployed (Yes/No). Responses for these two items were combined because they involved possibly concussive events. Yes responses were coded with a "1" and summed to create a count of the number of combat stressors each soldier reported (possible range: 0–4). Regarding the distribution of the combat stress variables, 14.3% experienced a blast or explosion, 3.6% experienced a vehicular accident/crash, 24.0% felt in great danger of being killed, 23.3% encountered dead bodies or saw people killed/wounded, and 9.3% were engaged in direct combat where they discharged their weapon; 39.7% reporting experiencing at least 1 combat stressor.

Deployment length was obtained from the DMDC Contingency Tracking System Deployment File. We calculated the number of days between the start and end of each soldier's deployment and divided by 30 in order to convert the count into months.

Model testing strategy

Growth mixture modeling was performed using MPlus Version 7.11 (Muthén & Muthén, 1998–2012). Soldiers were classified based on character at up to three post-deployment time points, and we modeled character following deployment with a single linear slope. We again tested one-, two-, and three-class solutions for overall character and using AIC, BIC, adjusted AIC, and entropy found two latent classes fit the data best. We constrained the post-deployment slope to linearity to facilitate model convergence, and a comparison of the trajectories in the freely estimated (i.e. data-defined change) and linear models revealed very small differences (See Supplement for further details).

Descriptive statistics and logistic regression analyses examining predictors of class membership were performed in SAS Enterprise Edition 7.1. All analyses were performed within the PDE.

Results

Sample characteristics. In our sample of 85,285 soldiers, the average age was 24.7 years old ($SD = 4.87$). The

sample was 86.3% male, 78.3% had a high school education or less, 66.5% were non-Hispanic White, and 91.1% were enlisted. The sample primarily came from the active duty component (73.8%), with the remainder of the sample coming from the Reserve (9.1%) or National Guard (17.1%) components. On average, soldiers had been in the service 2.6 years ($SD = 2.0$) at the time they deployed. Prior to deployment, average self-rated health was 4.3 out of 5, and 3.3% of the sample reported receiving psychiatric treatment within the past year. Soldiers' deployments lasted an average of 8.8 months ($SD = 2.6$), with 18.1% reporting experiencing an injury while deployed, and 39.7% reporting experiencing at least 1 combat stressor.

Character across the deployment cycle. As with Analysis 1, we identified two character classes (see supplementary materials). In general, both classes demonstrated fairly stable levels of character strengths following deployment (see Table 3). First, we observed a "resilient" or stable high overall character class, which had a high mean intercept (4.36) and a very slight positive (i.e. increasing) slope (0.06). Analyses of character subscales yielded similar patterns of character across time (intercepts: 4.31–4.59, slopes: 0.00–0.06; see Table 3). Second, we observed a persistent low overall character class, which had a lower mean intercept (3.47) and a near-zero negative (decreasing) slope (–0.03). In the persistent low class, we observed similar intercepts across the character subscales (3.30–3.59); however, we did observe some variation in the slopes. The slopes were fairly flat, and variation around these near-zero slopes was largely random and small for each of the character subscales. Because post-deployment changes were small or non-existent, the two classes primarily reflect intercept differences.

With respect to the demographic, military, and health predictors of class membership, the results were largely consistent with those reported in Analysis 1. We report them in full below.

Demographic predictors of group membership. Again, we entered all the predictors simultaneously in a logistic regression predicting membership in the resilient group but discuss the predictors in a thematic fashion.

Like in Analysis 1, higher age predicted resilience, with each additional decade corresponding to a 32% increased odds of being in the overall character resilient group ($OR = 1.32$, 95% CI = 1.27–1.37). The positive association between age and membership in the resilient class was also evident across the character subscales, with an increase in odds of 17% to 45% per decade (see Table 4). Males were more likely than females to be in the overall character resilient group ($OR = 1.20$, CI = 1.15–1.25), and males had a 13% to 28% increased odds of being in the resilient group in the intellect, civic strengths, and temperance subscale analyses, compared to females (Table 4). Having higher than a high school education was protective in the overall character analysis, with a 16% greater odds of being in the resilient class, compared to those with a high school education ($OR = 1.16$, 95% CI = 1.11–1.22). Greater education was also associated with greater odds of being in the resilient class in the intellect, civic strengths, and temperance analyses, but not in the warmth analysis (Table 4). Conversely, non-Hispanic White soldiers had a 22% lower odds of being in the overall character resilient class ($OR = 0.78$, 95% CI = 0.76–0.81), compared to soldiers of other racial and ethnic groups. The negative

Table 3. Character change across the deployment cycle (Analysis 2).

Analysis	Percent in class	Mean predicted probability	Post-deployment 1	Post-deployment 2	Post-deployment 3
Resilient					
Overall character	61.27%	0.86	4.36	4.39	4.41
Intellect	56.31%	0.81	4.31	4.35	4.38
Civic strengths	57.39%	0.83	4.56	4.57	4.59
Warmth	58.34%	0.84	4.59	4.59	4.59
Temperance	50.16%	0.79	4.45	4.46	4.46
Persistent low					
Overall character	38.73%	0.83	3.47	3.46	3.44
Intellect	43.69%	0.86	3.30	3.34	3.37
Civic strengths	42.62%	0.90	3.59	3.59	3.60
Warmth	41.66%	0.91	3.58	3.53	3.49
Temperance	49.84%	0.88	3.45	3.49	3.54

Analysis column refers to the character strength composite scale under study for that particular analysis—intellect (a composite of creativity, curiosity, critical thinking, love of learning, perspective/wisdom), civic strengths (honesty, teamwork, fairness, leadership), warmth (love/closeness with others, kindness, gratitude), and temperance (forgiveness, mercy, prudence/caution, self-control). Given the moderate to high correlations between each character strength subscale, we also created an "overall character" composite by averaging all the individual character strength items together. See the supplementary materials for model selection results and fit statistics from the growth mixture modeling analyses. Values for the character scores at post-deployment 1, post-deployment 2, and post-deployment 3 (the three right-most columns) are the means of each character strength at each wave, separated by class.

Table 4. Logistic regression model results for Analysis 2.

	Overall character		Intellect		Civic strengths		Warmth		Temperance	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Age (in decades)	1.319***	1.271–1.369	1.238***	1.196–1.282	1.392***	1.344–1.443	1.170***	1.130–1.212	1.448***	1.400–1.499
Sex (Ref: Female)	1.201***	1.149–1.254	1.276***	1.223–1.331	1.188***	1.139–1.240	1.021	0.978–1.066	1.129***	1.083–1.177
Education (Ref: HS or less)	1.163***	1.108–1.221	1.250***	1.194–1.310	1.070**	1.021–1.121	1.035	0.988–1.084	1.078***	1.031–1.127
Race/Ethnicity (Ref: non-White)	0.782***	0.757–0.808	0.826***	0.800–0.852	0.799*	0.774–0.824	0.742***	0.719–0.767	0.700***	0.679–0.721
Rank (Ref: Enlisted)	1.260***	1.173–1.354	1.250***	1.169–1.338	1.235***	1.154–1.321	1.057	0.990–1.128	1.108**	1.040–1.180
(Component (Reserve to AD)	1.449***	1.367–1.535	1.504***	1.424–1.589	1.332***	1.261–1.407	1.355***	1.282–1.431	1.325***	1.258–1.396
Component (Guard to AD)	1.339***	1.281–1.399	1.341***	1.286–1.399	1.295***	1.242–1.351	1.310***	1.256–1.367	1.222***	1.174–1.272
Time in service (in years)	1.009	1.000–1.018	1.014**	1.005–1.023	1.012**	1.003–1.021	0.996	0.988–1.005	0.994	0.986–1.002
Self-rated health (1–5, low to high)	1.638***	1.606–1.671	1.624***	1.592–1.656	1.631***	1.599–1.664	1.567***	1.536–1.598	1.546***	1.517–1.576
Mental Health treatment (Ref: No)	0.667***	0.616–0.722	0.717***	0.662–0.777	0.646***	0.597–0.700	0.717***	0.662–0.777	0.735***	0.679–0.795
Injured (Ref: No)	0.864***	0.830–0.898	0.884***	0.851–0.918	0.902***	0.868–0.938	0.890***	0.857–0.925	0.850***	0.819–0.883
Combat stressor count (0–4)	0.945**	0.909–0.983	0.944**	0.909–0.981	0.958*	0.923–0.996	0.918***	0.884–0.954	0.927***	0.893–0.961
Deployment length (in months)	0.973***	0.968–0.979	0.975***	0.970–0.981	0.976***	0.970–0.981	0.977***	0.972–0.983	0.975***	0.969–0.980

HS: high school; AD: active duty.

The top row refers to the character strength composite scale under study for that particular analysis—intellect (a composite of creativity, curiosity, critical thinking, love of learning, perspective/wisdom), civic strengths (honesty, teamwork, fairness, leadership), warmth (love/closeness with others, kindness, gratitude), and temperance (forgiveness, mercy, prudence/caution, self-control). Given the moderate to high correlations between each character strength subscale, we also created an "overall character" composite by averaging all the individual character strength items together.

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

association between non-Hispanic White soldiers and membership in the resilient class was also evident across the character subscale analyses (see Table 4).

Military predictors of group membership. Officers had a greater odds of being in the resilient class in the overall character analysis ($OR = 1.26$, CI = 1.17–1.35). The difference between officers and enlisted soldiers was also evident in the intellect, civic strengths, and temperance subscale analyses (Table 4). Like in Analysis 1, Reserve and National Guard soldiers were each more likely to be in the overall character resilient group than active duty soldiers ($OR = 1.45$, CI = 1.37–1.54 and $OR = 1.34$, CI = 1.28–1.40, respectively). This association was also observed in the subscale analyses (Table 4). Time in service prior to deployment was only a statistically significant predictor of class membership in two analyses: intellect and civic strengths.

Health predictors of group membership. Each unit increase in self-rated health was associated with a 64% greater odds of being in the resilient group in the overall character analysis ($OR = 1.64$, CI = 1.61–1.67), and the increased odds of resilient class membership held across all subscale analyses (Table 4). Psychiatric treatment in the year prior to deployment, on the other hand, was again associated with a lower odds of being in the resilient class in the overall character analysis ($OR = 0.67$, CI = 0.62–0.72), and this lower odds of resilient class membership held across all subscale analyses (Table 4).

Deployment experience predictors of group membership. Injuries during deployment, combat stress, and longer deployments were each associated with lower odds of being in the resilient class. Soldiers who reported being injured while deployed had a 14% lower odds of being in the resilient group in the overall character analysis ($OR = 0.86$, CI = 0.83–0.90). Across subscale analyses, injury was consistently related to greater odds of belonging to the persistent low class. Combat stress was also negatively related to resilience in all analyses, with 4% to 8% decreased odds of belonging to the resilient class with each successive combat stressor (Table 4). Longer deployment lengths also showed a negative association with resilience such that every additional month of deployment was associated with 3% lower odds of being in the overall character resilient class ($OR = 0.97$, CI = 0.97–0.98). The negative association between deployment length and resilient class membership was observed across all subgroup analyses (Table 4).

Separating the combat stress measure into its separate components revealed that some combat stressors were more influential than others. Specifically, the largest predictors of lower odds of being in the resilience class were being involved in a vehicular crash, feeling in great danger of being killed, and having an injury (see supplementary materials for full results).

General discussion

The current study is the first of its kind to examine the antecedents of changes in character strengths across a potentially adverse event — the military deployment cycle. Here, we examined the demographic, military, health, and deployment predictors of character strength development across the deployment cycle. We reproduced the pattern of findings reported by Chopik et al. (2021) — most soldiers reported high, stable levels of character strengths across the deployment; the remaining soldiers experienced declines in character across the deployment from which they did not recover (i.e. there was stability post-deployment). The strongest predictor of high, resilient character strength levels was self-rated physical health at baseline, followed by component (i.e. active duty, Reserve, or National Guard) and age. The significance and direction of many of the effects were consistent with other reports examining predictors of resilience in other psychological characteristics (Galatzer-Levy et al., 2018). Deployment experiences also had implications for character development. Being injured, experiencing more combat stressors, and having longer deployments were each associated with higher odds of being in the persistently low character strength group.

Does the deployment experience facilitate growth and resilience?

To date, there had been much theorizing about why soldiers might experience increases in positive characteristics across the deployment cycle. For example, stage-like models detailing the progression that soldiers advance through to facilitate growth highlight a complex process of internal and cognitive change (Tedeschi & McNally, 2011). Prior to formally studying this process, descriptive information that quantifies how common growth is among soldiers is important. In the current study, very little growth happened, suggesting that the deployment cycle is not associated with robust positive change, either on average or among subgroups of soldiers (based on the results of our growth mixture modeling). Rather, the most common response was one of resilience—that soldiers with particularly high character strengths did not change much at all, maintaining their high character after their deployments ended. Further, a proportion of soldiers (ranging from 37.56% to 49.84% across character strength dimensions and analyses) experienced declines in character strengths that persisted across three post-deployment time points. Further, this subgroup of soldiers also had higher odds of experiencing a number of combat-related stressors. The current study redressed many

of the methodological limitations of previous research—we examined prospective longitudinal data on a large group of soldiers experiencing a potentially adverse event—the deployment cycle and measured how characteristics of the soldiers and their deployment experiences predicted character growth. Again, the changes (even among this latter group) were very small. Altogether, the results suggest that character strengths are associated with pre-deployment risk factors (e.g. poor mental and physical health) and deployment experiences (e.g. injuries). Most relevant to previous theorizing about growth following deployment, the current results provide strong evidence that growth in positive personality traits is not common, and stability in positive personality traits is very common.

Individual and deployment-related predictors of character

In theory and research positing that people psychologically change in response to major life events, there is usually the assumption that there is something about an event specifically that causes changes in psychological characteristics (Bleidorn et al., 2018; Roberts & Nickel, 2017). Indeed, even in the post-traumatic growth literature, in which it would be hypothesized that some people might *increase* in character strengths across a deployment, the incidence and content of an adverse life event are thought to spur these changes as well (Tedeschi & Calhoun, 2004; Tedeschi & McNally, 2011). In our current analyses, the integration of predictors from both before and during the deployment experience allowed us to appropriately contextualize the effect sizes of event characteristics on character development. Relative to factors such as overall physical health and component (i.e. active duty, Reserve, or National Guard), the influence of deployment characteristics was smaller in size when predicting class membership. That is not to say that these factors were not important. The difference in odds between someone with zero combat stressors and four combat stressors translates to 22% greater odds of being a member of the persistently low group. Likewise, as deployment lengths increase by months, an extra six months would translate to 16% greater odds of being a member of the persistently low group. However, even when considering aggregate risk conferred by these deployment characteristics, pre-deployment characteristics were still much larger predictors of character development classes than deployment characteristics in Analysis 2.

But why do these predictors confer greater protection or risk in the context of character development? The fact that some predictors, such as age, were significant predictors likely reflects a general maturation process that is seen in other psychological characteristics (Roberts et al., 2006). Older soldiers in our sample may have potentially had more life experience and thus likely faced other events in the past that called for strong character and resilience. The largest predictor—self-reported health—is also intimately tied with changes in psychological characteristics (Takahashi et al., 2013; Wagner et al., 2016). Specifically, one perspective is that physical and sensory limitations lead to lifestyle changes and declines in energy, which may alter personality traits over time (Jokela et al., 2014; Stephan et al., 2016, 2017). The same may be true for character strengths. Similar processes that change either intrinsic or situation selection likely occur for characteristics such as gender and education as well (Jackson et al., 2012; Lüdtke et al., 2011; Stewart & Lykes, 1985; Stewart & Ostrove, 1998; Weisberg et al., 2011). In this regard, the ways in which age, health, and gender were associated with character strengths is also reasonably consistent with previous research.

Contextualizing character development from the current study

However, it is also worth acknowledging that little *development* actually occurred after the deployment experience. Indeed, there were pre- to post-deployment declines in character among one of the classes. However, little character change occurred during the post-deployment assessment waves. Character post-deployment is better characterized by stability than it is by change or development. Because there were only two classes of character development, our approach naturally considered the pre- and post-deployment assessments simultaneously in an effort to characterize character changes. Those who experienced declines were initially lower in character strengths prior to the deployment. In examining pre-deployment characteristics (e.g. rank, age) predicting membership in post-deployment trajectories of character, we could, in a way, merely be capturing an association that would exist without the presence of a deployment experience. One salient example is one we have already mentioned—lower levels of health predicting membership in the persistently low character class. Because character strengths and health are already interrelated, these predictors of character strength development classes could be capturing these pre-existing differences that occur prior to deployment. The deployment characteristics, on the other hand, are unlikely to suffer from this problem—they are largely stochastic experiences and are a function of situational characteristics thrust upon soldiers (e.g. deploying to a particularly dangerous location, being injured). The effects of deployment experience on subsequent character are likely captured using the approach we adopted.

In this way though, the associations between deployment experiences and character development are partially consistent with previous research as

well. Character strengths often capture a blend of virtues, values, trait-like constructs, positive adjustment, and well-being (Peterson & Seligman, 2004). Because character strengths are strongly associated with well-being (Park et al., 2004), and life satisfaction changes shortly after adjustment to life events (Lucas, 2007a), it is not surprising that character strengths might also change in response to life events given their shared variance with subjective well-being. The combat stressors and deployment experiences had similar effects on character strengths as they did on characteristics such as PTSD—they were associated with higher symptomatology and lower levels of character strengths (Bonanno, Mancini, et al., 2012).

Implications for the U.S. Army

The findings presented here have a few noteworthy implications for the U.S. Army. With their very large samples, our two analyses provide compelling evidence indicating that, while the majority of the U.S. Army soldiers report high character strengths and are resilient, a sizable minority of soldiers enter the Army with a number of risk factors that may predispose them to declines in character in response to the endemic hardships of Army life. Further, the character strengths of this minority not only decline across deployment, but these declines appear to be chronic across a number of years. In short, they do not "bounce back" even years following their combat experience. Conversely, those who were largely healthy at pre-enlistment tended to report high levels of character post-deployment. The implications here are strategically significant as they point toward the need for better pre-enlistment psychological and physical health screening.

Without such screening, the Army risks enlisting soldiers who, once exposed to combat, may experience declines in their character strengths which, in turn, may have implications for their health and well-being (Proctor et al., 2011; Proyer et al., 2013). However, our findings do not suggest that soldiers with these risk factors (or lower levels of character) should be excluded from Army service altogether. Rather, these findings may prompt the Army to direct those recruits who score lower on pre-enlistment screening to job areas that do not require deployment to combat situations (e.g. training cadre, institutional support staff). Further, identifying and retaining soldiers who are resilient in the face of deployment stressors should also be a goal of the Army. Stated succinctly, our study provides important—albeit emergent—evidence that there exists a group of Army soldiers who may be at higher risk for experiencing declines in character strengths—and possibly other positive characteristics—when encountering stressful situations such as deployments.

Additionally, our study calls into question, at least in a small way, an important component of Army leadership development doctrine, that of *character development*. Specifically, the Army's leadership development doctrine states that character is "developed through continual study, reflection, experience, and feedback" (U.S. Army, 2012, pp. 3–5). Some of this doctrine may very well be true, and it aligns well with similar theoretical processes employed in the post-traumatic growth literature (Tedeschi & McNally, 2011). However, our analyses suggest that the deployment experience is not likely one of these experiences that helps develop character. In most cases, character strengths are largely unchanged on average. In other cases, the deployment experience is actually associated with declines in character for a sizable minority of soldiers. This finding is consistent with the emergent moral injury literature (Currier et al., 2015) and suggests that, absent following the recommendations made above, the Army should continue to target character through initiatives such as the Center for the Army Profession and Leadership's Character Development Project, as well as other evidence-based, psychosocial development programs such as Battlemind Training (Adler et al., 2009), mindfulness training (Jha et al., 2015), and Comprehensive Soldier and Family Fitness (Cornum et al., 2011, 2012). It is worth noting that soldiers included in our study continued to receive both job and combat simulation training in the years that followed their actual combat deployment. However, character strengths did not improve across time. The lack of even small changes following the deployment transition suggest that much of the training simulations that soldiers receive are unlikely to be effective in enhancing character, as they have been designed to cultivate. Character stability is not problematic per se for the "resilient" category but may be problematic for the "persistent low" category as combat exposure led to chronically low character scores following their deployment experience.

Limitations and future directions

The current study had several strengths. Along with Chopik et al. (2021), it is the most comprehensive examination of character strength development ever conducted. Further, the studies are the only ones to date to examine how character strengths change in response to a potentially adverse event—the deployment transition. We followed Army soldiers for approximately three years, capturing their character strengths before they deployed and up to three times after they returned. We also were able to record their deployment experiences and use these experiences as predictors of character development.

Nevertheless, there are limitations that are worth acknowledging. First, as with many other studies

examining how people adapt to adverse circumstances, we did not have a control group of otherwise identical soldiers who did not deploy or people who were not enlisted in the Army altogether. Having such a control group would allow us to examine the normative trajectories of character strengths across the same interval among people who are similar to the participants in our study (Jackson et al., 2012; Lucas, 2005, 2007a, 2007b; Schwaba & Bleidorn, 2019; Specht et al., 2014; van Scheppingen et al., 2018). In other words, in examining how non-deploying soldiers change in character strengths, it is entirely possible that the same two classes of change might emerge. Of course, some studies on the normative development of character strengths exist either using the VIA classification (Martínez-Martí & Ruch, 2014), other classifications (Isaacowitz et al., 2003), or examining individual character strengths (e.g. gratitude; Chopik et al., 2019b). Nevertheless, compared to other psychological characteristics, very few large-scale longitudinal studies on character strengths exist. A more comprehensive study examining character strength development would follow both soldiers and similar non-soldiers over time to examine how the two groups differ.

In the current study, we had very crude measures of deployment experiences with which to use as predictors of character development. Specifically, we had a checklist of deployment-related experiences that were self-reported and administrative data that informed us how long a deployment lasted. This was unfortunate given that much of the context and interpretation of these life events is missing when these checklists are used (Bleidorn et al., 2018). Life events vary on a number of dimensions and few taxonomies exist that characterize which life events are most likely to lead to changes in psychological characteristics (Chopik et al., 2019a). In one of the few exceptions, Luhmann et al. (2021) have provided an initial framework for describing how and why some events, such as deployment, might lead to lasting changes in psychological characteristics. This framework includes a description of the many different dimensions on which life events can vary, including the appraisal and controllability of the events. Such features of a deployment experience might explain why character strengths change for some soldiers and not others (and how some life events spur change and others do not, in general). Further, in examining how and why character strengths (do or do not) change upon returning from a deployment, it is important to consider factors and situations that occur *after* a particular life event takes place. These post-event contexts might alter one's interpretation of the event and ultimately the downstream consequences of not only that event but also any psychological changes that result from it (Tedeschi & McNally, 2011). For example, among soldiers returning from a deployment, there are likely situations that promote stability in character strengths, given we observed so few changes following deployment. Understanding the factors that promote stability and changes in character strengths is an important direction for future research.

Finally, the scope of the current study was necessarily limited—examining the antecedents of character change following deployment. However, it is also important to examine the consequences of these character changes. For some individuals, their character strengths declined from pre- to post-deployment. Specific deployment experiences—and the deployment experience overall—can be stressful for many soldiers, often translating to higher PTSD and depressive symptoms (Bonanno, Mancini, et al., 2012; Galatzer-Levy et al., 2018; Porter et al., 2017; Rodin et al., 2017). However, whether or not the declines in character strengths as a result of deployment significantly affect soldiers' lives and well-being are separate questions entirely. Likewise, are those soldiers who are resilient in character happier and healthier in the years after they return from their deployment? Successfully recovering or weathering stressful events is often associated with more meaningful and positive assessments of those events (Jayawickreme & Blackie, 2014). It is also possible that pre-deployment (or intercept differences in) character might explain why the two classes of soldiers differ on health and well-being outcomes. Associations between mean-level character strengths, health, and well-being suggest that this might be a possibility (Gander et al., 2020; Proyer et al., 2013; Wagner et al., 2020). Future research can examine the consequences of these changes in character strengths for soldiers' health and well-being.

Conclusion

The current study examined changes—and predictors of changes—in character strengths across the deployment transition. Most soldiers exhibited high, stable levels of character across the deployment cycle; the remaining soldiers experienced initial declines pre- to post-deployment, followed by stability in character strengths. The largest predictor of membership in the stable high class was being healthy at baseline, followed by being in the Reserve or National Guard and being older. Deployment characteristics mattered too—being injured, experiencing combat stressors, and having longer deployments were associated with a lower likelihood of membership in the stable, high character strength group. Future research should examine the *consequences* of these changes in character strengths, as well as more precisely isolate the effects of potentially adverse events—such as deployments—on subsequent character development.

Data Accessibility Statement

Due to the security and sensitivity of the data and the proprietary nature of the measures for Analyses 1 and 2, they could not be made publicly available. However, researchers interested in additional analyses or reproducing the results can contact any of the first three authors. Further, we have made analysis scripts available for reproduction purposes via our OSF page (https://osf.io/89xvk).

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Notes

1. We acknowledge, however, that this definition of resilience does not contain the hallmark of "bouncing back" following an initial decrease in standing on a psychological characteristic after a potentially adverse event (Infurna & Jayawickreme, 2019).
2. Based on the recommendation of a reviewer, we re-ran the analyses using a growth curve modeling approach. Modeling an intercept and slope of changes in character fit the data well (comparative fit index = .957, root mean square error of approximation = .043). Similar to the results found in the main analysis, there was significant variability in the intercepts ($M = 4.063$; variance: $b = .256$, $p < .001$) and relatively small declines in overall character, with significant variability (i.e. $M = -.034$; variance: $b = .023$, $p < .001$) in character strengths over time. A follow-up analysis examining predictors of the intercepts and slopes found in Analysis 1 yielded similar results to those that are presented later in the text. Specifically, higher character intercepts were positively associated with age, being male, higher education, being in the Reserve or Guard, and having good health. Lower character intercepts were associated with higher ranks, having sought treatment for mental health, and being non-Hispanic White. There were fewer significant predictors of slopes. Older soldiers declined in character at a more dramatic rate. Men, higher ranked soldiers, being in the Guard, and those with better physical health had less dramatic declines in character strengths. A summary of these results can be found in the supplementary materials.
3. This broader GAT instrument (later rebranded as Azimuth Check) was subjected to a major factor analytic effort aimed at consolidating the many scales provided to soldiers (Vie et al., 2016). In the current study, we specifically focused on the measurement of character strengths instead of an exhaustive examination of the 11 other identifiable constructs in the GAT, which we did not have a strong theoretical basis to examine or expect changes (e.g. organizational trust). Ultimately, there were four broad character-related factors (and a composite measure) that characterized and summarized the 24 traditionally measured character strengths in this particular sample.
4. As seen in the supplement, entropy levels from the growth mixture modeling were quite low. With a low entropy, the worry is that people are being classified into their classes randomly rather than a more systematic pattern of people being in the resilient (i.e. "stable high") character class. Based on our initial GMM, across the five outcomes, 59.23% of soldiers were classified as resilient in at least four models, suggesting a great deal of consistency in whether people were classified as being stably high in character. In other words, being stably high in one character strength over time was associated with being stably high in another character strength over time, suggesting that the model was consistently classifying soldiers.

Supplemental material

Supplemental material for this article is available online.

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