successfully respond to challenging events by withstanding or adapting to stressors, and 3) recover, either by returning to baseline or an improved state through learning and growth. Existing theory a typically focused on either individual or organizational resilience, with little consideration for team/unit resilience, or potential cross-level effects. To this end, we integrate established construct validatio advancements in multilevel theory and methodology to propose a framework to empirically establish resilience as a multilevel construct. Addressing each step in our methodology will help clarify how to accurately assess resilience at the unit level, and importantly, how it relates to other constructs residing at the same or proximal levels.

Introduction

Prior research has been inconsistent with the conceptualization and operationalization definition of resilience (see Table 1). Additionally, this research has remained at a single level of analysis, with little cross-level considerations.

Recent developments have conceptualized resilience as an emergent state[1], a phenomenon that emerges at the team or unit-level, through dynamic individual-level interactions[2].

The next step is to develop and validate a multilevel resilience framework to help advance this research using a consistent conceptualization.

Table 1. ***Prior Team Resilience Definitions***

Author(s)	Definition
Alliger et al. (2015)	• The *capacity of a team* to withstand and overcome stressors in a manner that enables sustained performance.
Carmeli et al. (2013)	• The *team's belief* that it can absorb and cope with strain, as well as a team's capacity to cope, recover, and adjust positively to difficulties
Edson (2012)	• *Adaptation* that supports successful achievement of goals and objectives, as well as learning for future planning and preparation.
Meneghel et al. (2016)	• The *capacity* of a team to bounce back from failure, setbacks, conflicts, or any other threat to well-being
Morgan et al. (2015)	• A *dynamic, psychosocial process* which protects a group of individuals from the potential negative effect of the stressors they collectively encounter
Sharma & Sharma (2016)	• The *process* by which teams/groups bounce back and sustain in the facade of adverse conditions
Van der Beek & Schraagen (2015)	• The *ability* of the team to respond, monitor, anticipate, and learn
West et al. (2009)	• The *capacity* to bounce back from failure, setbacks, conflicts, or any other threat to well-being that the team may experience

Method

We integrate a multilevel construct validation technique[3] (Table 2) with a new framework of unit resilience (Figure 1) to explicate the emergence of resilience in Army units.

Psychometric properties of responses from individual soldiers regarding their unit will be analyzed at each phase to empirically validate resilience as a multilevel construct.

- Resilience is thought to emerge from the interactions between team members and their collective ability to prepare for, respond to, and recover from stressors in a manner that enables sustained performance.

Method (con't.)

Using a referent-shift approach, the factor structure, inter-rater reliability (r_{wg}), inter-rater agreement (ICC(1) & (2)), and the scale reliabilities will be examined.

- r_{wg}: used to provide justification to aggregate scores to unit level, ≥ 0.70[4]
- ICC(1): within-unit variance attributable to a higher order construct[5,6]
- ICC(2): reliability of the higher level means[5,6]

Table 2. ***Construct Validation Framework Steps[3]***

Step Name	Description
1. Definition	• Define the construct at each relevant level of analysis • Determine whether the construct should be expressed as multidimensional or unidimensional • Determine the nature of the construct (measures of central tendency or variability)
2. Method of Measurement	• Determine the method of aggregation to best capture the construct at the team/unit level
3. Psychometric Properties	• Compare the factor structure of the measure across levels of analysis • Measure and examine the internal consistency across levels of analysis • Check to make sure there is sufficient justification for response aggregation
4. Variability Between Levels	• Check to make sure there is variability at different levels of analysis
5. Function Across Levels	• Identify antecedents, correlates, and outcomes associated with the construct across levels of analysis • Empirically test for similarities and dissimilarities in those relationships with the construct across different levels

Unit Resilience Framework

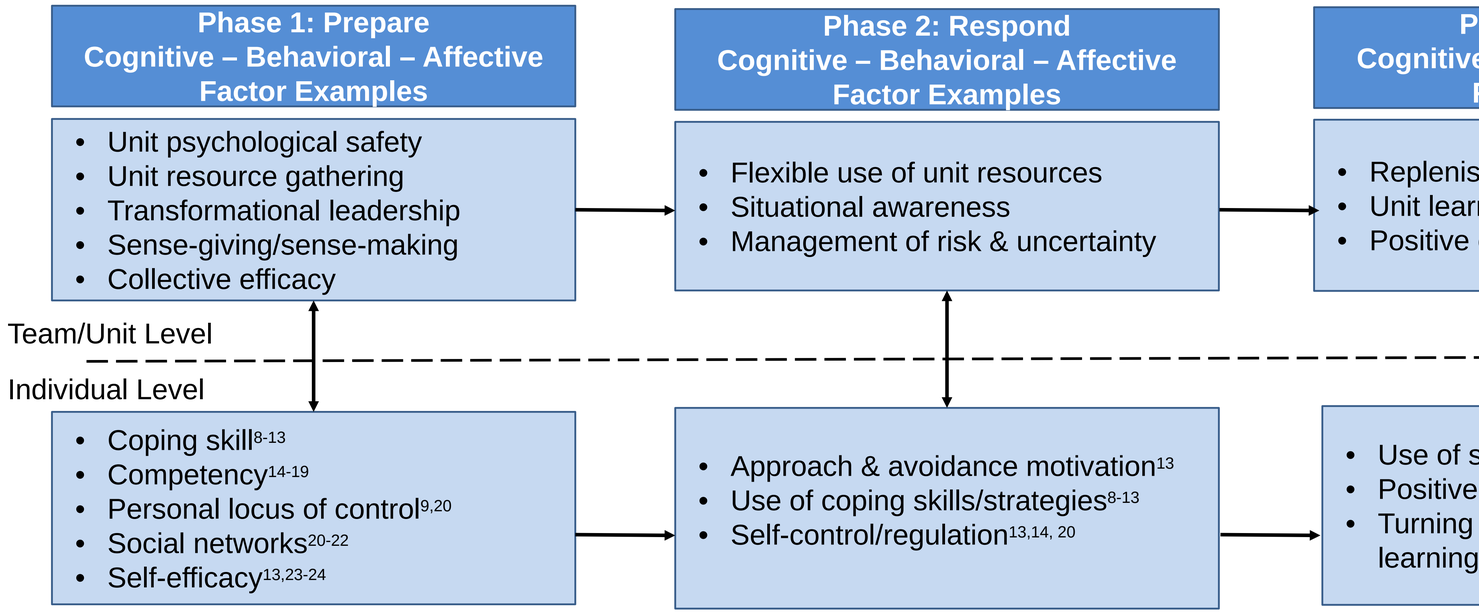

Figure 1. ***Unit Resilience Framework***

Discussion

Empirically validating resilience as a mult
attempted in the published literature, mak
guidance in conducting that research.

Advancing a definition of resilience at mu
researchers with a foundation on which to

- Provides a conceptualization of resilie
  future research.
- Will allow for a consistent comparison

By incorporating a multilevel perspective
for the individual level influences on the te
on the individual.

- Benefits the US Army by identifying sp
  contribute to their team's resilience.
- Develops more effective, high-performi

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References

1. Bowers, C., Kreutzer, C., Cannon-Bowers, J., & Lamb, J. (2017). Team resilience as a second-order emergent state: A theoretical model and research directions. *Frontiers in Psychology*, 8, 1360.
2. Marks, M. A., Mathieu, J. E., & Zaccaro, S. J. (2001). A temporally based framework and taxonomy of team processes. *Academy of Management Review*, *26*(3), 356-376.
3. Chen, G., Mathieu, J. E., & Bliese, P. D. (2005). A framework for conducting multilevel construct validation. In F. J. Dansereau & F. Yammarino (Eds.), *Research in multi-level issues: The many faces of multi-level issues* (pp. 273-303). Oxford, UK: Elsevier Science.
4. James, L. R., Demaree, R. G., & Wolf, G. (1984). Estimating within-group interrater reliability with and without response bias. *Journal of Applied Psychology*, *69*(1), 85-98.
5. Bliese, P. D. (2000). Within-group agreement, non-independence, and reliability: Implications for data aggregation and analysis. In K. J. Klein & S. W. J. Kozlowski (Eds.), *Multilevel theory, research, and methods in organizations: Foundations, extensions, and new directions* (pp. 349-381). San Francisco: Jossey-Bass.
6. LeBreton, J. M., & Senter, J. L. (2008). Answers to 20 questions about interrater reliability and interrater agreement. *Organizational Research Methods*, *11*(4), 815-852.
7. Cato, C., Blue, S., & Boyle, B. (2019). *A Systematic Review of the Unit Resilience Literature through 2016.* [unpublished manuscript]
8. Bonanno, G. A., & Burton, C. L. (2013). Regulatory flexibility: An individual differences perspective on coping and emotion regulation. *Perspectives on Psychological Science*, *8*(6), 591-612.
9. Connor, K. M., & Davidson, J. R. T. (2003). Development of a new resilience scale: The Connor-Davidson Resilience Scale (CD-RISC). *Depression and Anxiety, 18*, 76-82.
10. Folkman, S. (1984). Personal control and stress and coping processes: A theoretical analysis. *Journal of Personality and Social Psychology, 46,* 839-852.
11. Folkman, S., Lazarus, R. S., Gruen, R. J., & DeLongis, A. (1986). Appraisal, coping, health status, and psychological symptoms. *Journal of Personality and Social Psychology, 50,* 571-579.
12. Southwick, S. M., Bonanno, G. A., Masten, A. S., Panter-Brick, C., & Yehuda, R. (2014). Resilience definitions, theory, and challenges: Interdisciplinary perspectives. *European Journal of Psychotraumatology, 1,* 25-38.
13. Rossouw, P. J., & Rossouw, J. (2016). The predictive 6-factor resilience scale: Neurobiological fundamentals and organizational application. *International Journal of Neuropsychotherapy*, *4*, 31-45.
14. Blaustein, M. E., & Kinniburgh, K. M. (2018). *Treating traumatic stress in children and adolescents: How to foster resilience through attachment, self-regulation, and competency (2nd Ed.).* New York: The Guilford Press.
15. Friborg, O., Hjemdal, O., Rosenvinge, J., & Martinussen, M. (2003). A new rating scale for adult resilience: What are the central protective resources behind healthy adjustment? *International Journal of Methods in Psychiatric Research, 12*, 65-76. doi:10.1002/mpr.143
16. Garmezy, N. (1985). Stress-resistant children: The search for protective factors. In J. E. Stevenson (Ed.), *Recent research in developmental psychopathology*: *Journal of child psychology and psychiatry book Supplement, No. 4* (pp. 213-233). Oxford: Pergamon.
17. Garmezy N. (1981). Resilience and vulnerability to adverse developmental outcomes associated with poverty. *American Behavioral Scientist, 34,* 416–430.
18. Garmezy N., Masten A. S., & Tellegen A. (1984). The study of stress and competence in children: A building block for developmental psychopathology. *Child Development*, *55,* 97–111.
19. Masten, A. S. (2001). Ordinary magic: Resilience processes in development. *American Psychologist, 56*(3), 227-238.
20. Rutter, M. (2013). Annual research review: Resilience – clinical implications. *Journal of Child Psychology and Psychiatry, 54*, 474-487.
21. Southwick, S. M., Vythilingam, M., & Charney D. S. (2005). The psychobiology of depression and resilience to stress: Implications for prevention and treatment. *Annual Review of Clinical Psychology, 1,* 255–91.
22. Werner, E. E., & Smith, R. S. (1982). *Vulnerable but invincible: A study of resilient children*. New York: McGraw-Hill.
23. Rutter, M. (1985). Resilience in the face of adversity: Protective factors and resistance to psychiatric disorders. *British Journal of Psychiatry, 147*, 598–611.
24. Rutter, M. (1987). Psychosocial resilience and protective mechanisms. *American Journal of Orthopsychiatry, 57, 316–331*.
25. Seligman, M. E. P., & Csikszentmihalyi, M. (2000). Positive psychology. *American Psychologist, 55,* 5–14.
26. *Alliger, G. M., Cerasoli, C. P., Tannenbaum, S. I., & Vessey, W. B. (2015). Team resilience. *Organizational Dynamics*, *44*(3), 176-184.
27. *Carmeli, A., Friedman, Y., & Tishler, A. (2013). Cultivating a resilient top management team: The importance of relational connections and strategic decision comprehensiveness. *Safety Science*, *51*(1), 148-159.
28. *Edson, M. C. (2012). A complex adaptive systems view of resilience in a project team. *Systems Research and Behavioral Science*, *29*(5), 499-516.
29. *Meneghel, I., Salanova, M., & Martínez, I. M. (2016). Feeling good makes us stronger: How team resilience mediates the effect of positive emotions on team performance. *Journal of Happiness Studies*, *17*(1), 239-255.
30. *Morgan, P. B., Fletcher, D., & Sarkar, M. (2015). Understanding team resilience in the world's best athletes: A case study of a rugby union World Cup winning team. *Psychology of sport and exercise*, *16*, 91-100.
31. *Sharma, S., & Sharma, S. K. (2016). Team resilience: Scale development and validation. *Vision*, *20*(1), 37-53.
32. *van der Beek, D., & Schraagen, J. M. (2015). ADAPTER: Analysing and developing adaptability and performance in teams to enhance resilience. *Reliability engineering & system safety*, *141*, 33-44.
33. *West, B. J., Patera, J. L., & Carsten, M. K. (2009). Team level positivity: Investigating positive psychological capacities and team level outcomes. *Journal of Organizational Behavior: The International Journal of Industrial, Occupational and Organizational Psychology and Behavior*, *30*(2), 249-267.

**indicates reference was used in a table*

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14. ABSTRACT

Unit resilience, defined here as a multi-phasic process in which members of the unit collectively apply their respective skills, abilities, and resources to: 1) prepare for adversity by planning and anticipating problems, 2) successfully respond to challenging events by withstanding or adapting to stressors, and 3) recover, either by returning to baseline or an improved state through learning and growth. Existing theory and research on resilience has typically focused on either individual or organizational resilience, with little consideration for team/unit resilience, or potential cross-level effects. To this end, we integrate established construct validation principles with recent advancements in multilevel theory and methodology to propose a framework to empirically establish resilience as a multilevel construct. Addressing each step in our methodology will help clarify how we conceptualize resilience, how to accurately assess resilience at the unit level, and importantly, how it relates to other constructs residing at the same or proximal levels.

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