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To cite this article: Shannon K. Cheng, Danielle D. King & Frederick L. Oswald (2020): Understanding How Resilience is Measured in the Organizational Sciences, Human Performance, DOI: [10.1080/08959285.2020.1744151](https://doi.org/10.1080/08959285.2020.1744151)

To link to this article: <https://doi.org/10.1080/08959285.2020.1744151>



Published online: 07 Apr 2020.



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Understanding How Resilience is Measured in the Organizational Sciences

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ABSTRACT

Resilience is a topic of growing interest in the workplace; however, regarding its definition and measurement, a wide range of perspectives and idiosyncrasies persist. We take a closer look at the state of resilience through item-level analyses of 14 publicly available measures. In Study 1, relevance ratings revealed that many items from the measures were not aligned with subject matter experts' (SMEs) conceptualizations of resilience. In Study 2, SMEs were able to sort the relevant items reliably into eight categories. In Study 3, four factors summarized participant responses to these items, and these factors aligned with the categories from Study 2. Moreover, resilience scales based on these four factors demonstrated expected patterns of convergent and discriminant validity. Implications for resilience theory and measurement are discussed.

Introduction

Resilience has been studied for decades as an important construct concerning how people “bounce back” and positively adapt after experiencing adverse events (King, Newman, & Luthans, 2016; Sutcliffe & Vogus, 2003). Resilience has been distinguished from related constructs, such as thriving, grit, conscientiousness, and emotion regulation, due to its focus on how people specifically respond and adapt to difficult events and situations – not merely how they function in everyday life (King et al., 2016). Research on resilience began in developmental and clinical psychology, examining at-risk youth and adult populations who had experienced or were more likely to experience stress or trauma in their lives. The world of work is often characterized by changing organizational structures and turbulent intrapersonal and interpersonal processes, where many employees have to deal with a multitude of challenges. As such, organizational science researchers and practitioners have become increasingly interested in the understanding, measurement, and improvement of resilience (Britt, Shen, Sinclair, Grossman, & Klieger, 2016; Linnenluecke, 2017) – examining how resilience can improve processes and outcomes in the workplace and how individuals, teams, and organizations can build their capacity for resilience. However, as with any complex, multilevel, and dynamic phenomena, workplace resilience comes with a wide array of research promises and challenges (Britt et al., 2016; Hartmann, Weiss, Newman, & Hoegl, 2019; King et al., 2016).

For example, how to define and thus how to measure resilience remains one of the most persistent and important issues in resilience research. In a recent review, Harms, Brady, Wood, and Silard (2018) described how resilience can mean being able to “resist being damaged or deformed by traumas or destructive forces” or being able to “readily ‘[bounce] back’ or recover from those traumas or destructive forces” (Harms et al., 2018, p. 1). They argue that these two meanings have led to two different research streams – one in which resilience is viewed as an individual trait or capacity and another in which resilience is viewed as a response process in light of

facing adverse events (Harms et al., 2018). Within each stream, there are also multiple definitions and models. For example, when examining resilience as a response process, experts disagree on a predominant resilience response pattern (Becker & Ferry, 2016; Bonanno, 2005; Harms et al., 2018; Luthar, Cicchetti, & Becker, 2000): there can be stress-resistant resilience (not reacting negatively to an adverse event), “bouncing back” resilience (reacting negatively but then quickly adapting), post-traumatic growth (reacting negatively, quickly adapting, and growing further), and recovery to set point (negatively reacting, followed by longer-term adaptation). Negative response patterns include delayed reaction (reacting normally after an adverse event, but then showing signs of distress later on) and lack of recovery (where individuals experience chronic distress after an adverse event). Being able to measure and distinguish among these process-driven response patterns would be best informed by a longitudinal design that includes assessments of functioning pre- and post-adversity (e.g., Kalisch et al., 2019; Ratcliff, Mahoney-Nair, & Goldstein, 2019). This is a very valuable perspective of resilience; however, because the trait/capacity view is currently the more common perspective in the resilience domain, our work focuses on this first definition and empirically examines the current state of such resilience measurement.

Although many researchers have focused on resilience as a trait or capacity, there is still disagreement concerning whether resilience is best operationalized as a single, unitary construct (e.g., Brief Resilience Scale; Smith et al., 2008) or a multidimensional construct (e.g., Five-by-Five Resilience Scale; DeSimone, Harms, Vanhove, & Herian, 2017). When defining a broad and complex construct such as resilience, some disagreement is to be expected, even among experts. To better understand and address these disagreements, a systematic approach applied to the different measures of resilience can help move this field forward. In this paper, we are attempting to do just that, as the resilience domain is currently limited by both construct proliferation, where many distinct-yet-similar constructs have accumulated (Shaffer, DeGeest, & Li, 2016), and construct mixology, where new constructs are formed by combining older ones (Newman, Harrison, Carpenter, & Rariden, 2016). For example, existing resilience scales have factor structures that include adaptability, self-efficacy, social support, emotion regulation, and optimism, which are all constructs that have been separately measured and studied in the organizational sciences without invoking the construct of resilience (e.g., Grandey, 2000; Kluemper, Little, & DeGroot, 2009; Kossek, Pichler, Bodner, & Hammer, 2011; Lunenburg, 2011; Pulakos, Arad, Donovan, & Plamondon, 2000). This clarification, of whether current resilience scales are measuring other constructs, is especially important if we are arguing that resilience is a distinct construct.

Thus, we have engaged in an earnest investigation of resilience measures in the organizational sciences, asking how resilience as a construct is currently being measured and how these methods can be improved. For example, are the other constructs often reflected in resilience measures integral aspects of what it means to be resilient? Or is it better to think of these constructs as potential predictors, outcomes, or correlates of resilience (Britt et al., 2016; Harms et al., 2018)? Both approaches spark interesting theoretical questions. The former suggests that it is useful to know whether the intersection (overlap) of the constructs or the union of the constructs (overlap plus uniqueness) reflect resilience; this question is related to issues around reflective versus formative measurement (Edwards & Bagozzi, 2000) and compound constructs (Hough & Ones, 2001). The latter suggests that the constructs are components of a larger longitudinal resilience model or process – and current resilience researchers may run the risk of focusing on, measuring, and modeling only a limited part of the resilience process that they intend to study. It is important for our field to critically think about these theoretical distinctions; otherwise, a lack of conceptual clarity will continue to hinder research progress, proper measurement development, and practical conclusions in the resilience domain (Podsakoff, MacKenzie, & Podsakoff, 2016). At the very least, there is some shared knowledge among experts that resilience is a unique construct critical for success at life both inside and outside of work. Now it is our responsibility as organizational science researchers to understand what resilience is – and what it is not – when designing, evaluating, and using resilience measures.

The importance of item-level analyses in resilience measurement

Recent research has begun to provide needed insights into the current state of resilience measurement. Hartmann et al. (2019) provide a review of workplace resilience literature, discussing research on existing resilience measures, antecedents of resilience (e.g., personality traits and cultural value orientation, personal resources, personal attitudes and mind-sets, personal emotions, work demands and resources), and outcomes of resilience (performance, mental and physical health, work-related attitudes, change-related attitudes). Windle, Bennett, and Noyes (2011) also reviewed the reliability and validity of several existing resilience measures, in addition to the theoretical bases and item selection processes underlying the measures. Both of these reviews provide invaluable information, such as highlighting what variables resilience might be related to in the workplace and what measures have the highest reliability and validity. However, although some measures were identified as relatively better than the others, they were still identified as “only moderate” in quality (Windle et al., 2011, p. 14). As a result, we decided to take the important step of critically examining specific items across existing resilience measures and understanding how these items relate to our conceptualizations and understanding of resilience.

In general, when a scale is initially developed, researchers tend to conduct several item-level empirical analyses, such as examining the absolute and relative magnitudes of item factor loadings in a confirmatory factor analysis (CFA) and the change in Cronbach’s alpha when an item is deleted. But after the initial development and refinement of a measure, scholars rarely examine the properties of items further. Instead, researchers tend to act as if the scale and its item properties remain relatively fixed, and there is justification for that strategy. For example, many researchers seek to answer larger research questions using a given measure, based on past evidence in support of the measure (changing the measure would actually weaken that evidence; Heggstad et al., 2019). In addition, a standardized measure allows for information from past studies to inform future studies and can contribute to meta-analyses that use the type of measure as a moderator (e.g., McAbee & Oswald, 2013). That said, item-level statistics can remain useful in informing and improving future measure development, whether that means refining existing measures or creating new ones. For instance, we rarely know the extent to which items and scales are influenced by sampling error variance or particular features of the sample or setting, but an item-level meta-analysis could help us understand that, as past research has demonstrated (e.g., Carpenter, Son, Harris, Alexander, & Horner, 2016). In addition to taking a statistical approach to items *within* a measure, as a field, we can also spend more time conceptually examining the redundancy and uniqueness of content *across* measures that claim to represent the same construct. We often approach this problem empirically and at the scale level (e.g., in a one-factor CFA, multiple items are indicators that receive “votes” from the factor being modeled). But content analysis at the item level serves as a valuable complement. For example, if two different measures of a construct are found to correlate $r = .90$, is that because most of the item content is the same, or is it because the constructs are somehow related, even though the content is quite different? We cannot know the difference from the correlation alone, and two measures can correlate this highly yet still have very different criterion-related validity (e.g., mathematically, with measures that correlate .90, the validity can be as high as $r = .40$ for one measure yet have zero validity for the other; Stanley & Wang, 1969). We should examine the item content directly to understand conceptual overlap, but this is rarely done, especially across different measures.

In short, there is much more we can learn at the item level, both conceptually and statistically, across measures of the same construct. Particularly with a construct like resilience, with a multitude of available scales based on diverse conceptualizations, it seems especially important to understand what items are being used “underneath the hood” of these scales and how they relate to our broader understanding of resilience. Thus, the central purpose of this paper is to highlight the current state of resilience measurement via empirical item-level analyses of a comprehensive set of publicly available resilience measures. Our first step in this process is examining the content validity of the items by

having resilience subject matter experts (SMEs) rate whether items from the set of resilience scales are aligned with their conceptual understanding of resilience. The second step is having another set of resilience SMEs sort the items into as many (or as few) categories as they like, based on the items' perceived relatedness (McKeown & Thomas, 1988; Moore & Benbasat, 1991). We then mathematically capture the categories common across the SMEs' sorting. Next, we have a sample of working adults complete the resilience items, then conduct a CFA (followed up by an exploratory factor analysis) to determine how well the categories determined by SME consensus fit respondent data. We then refine the factors by retaining only the highest-loading items and examine the convergent and discriminant validity of scales containing only these items, comparing them with measures of related constructs (e.g., Big Five personality, self-efficacy, adaptability, emotion regulation, social support, optimism). Overall, this process adopts multiple methods to highlight the correspondence (or lack thereof) among (a) researchers' conceptualizations and operationalizations of resilience measure items, (b) what the item content and data actually reflect, and (c) other related constructs. Altogether, this systematic approach will help contribute to our understanding of how resilience is currently defined, operationalized, and measured.

Method

Inclusion criteria for measures

We searched for relevant resilience measures using PsycINFO and Google Scholar with the Boolean search terms (*resilience* or *resiliency* and *measure*) and (*resilience* or *resiliency* and *scale*). We also examined the measures included in previous review articles (e.g., Harms et al., 2018; Hartmann et al., 2019; Windle et al., 2011). Measures were included if they were (1) publicly available (in the spirit of open science, so that everyone can access the items), (2) published in English, and (3) relevant to the working adult population (e.g., measures for children or adolescents were excluded). From this, 14 measures were selected: Employee Resilience in Organizations Scale (Amir & Standen, 2012), Baruth Protective Factors Inventory (Baruth & Carroll, 2002), Ego-Resiliency Scale (Block & Kremen, 1996), Connor-Davidson Resilience Scale (Connor & Davidson, 2003), Five-by-Five Resilience Scale (DeSimone et al., 2017), Resilience Scale for Adults (Friborg, Hjemdal, Rosenvinge, & Martinussen, 2003), Resilience Competency Scale (Griffith & West, 2013), Resilience Appraisal Scale (Johnson, Gooding, Wood, & Tarrier, 2010), Psychological Capital (PsyCap)'s Resiliency Dimension (Luthans, Avolio, Avey, & Norman, 2007), Employee Resilience Scale (Naswall, Kuntz, & Malinen, 2015), Brief Resilience Coping Scale (Sinclair & Wallston, 2004), Brief Resilience Scale (Smith et al., 2008), Resilience Scale (Wagnild & Young, 1993), and Resilience at Work Scale (Winwood, Colon, & McEwen, 2013). See [Appendix A](#) for the full list of resilience items, organized by scale. There were 290 items across these 14 resilience measures. Other resilience measures exist (e.g., Dispositional Resilience Scale; Bartone, Ursano, Wright, & Ingraham, 1989; Global Assessment Tool; Peterson, Park, & Castro, 2011; Workplace Resilience Instrument; Mallak & Yildiz, 2016; Workplace Resilience Inventory; McLarnon & Rothstein, 2013),¹ and certainly new measures will be developed in the future. However, we believed that we had a reasonable and representative set of items to proceed usefully with these 14 measures, for multiple reasons: (a) these measures are in popular use by researchers (see Hartmann et al., 2019 for a review) and readily accessible by the

¹The Dispositional Resilience Scale (DRS; Bartone et al., 1989) is a well-known and commonly used resilience measure (although not mentioned in Hartmann et al., 2019). We did not initially include the DRS, because despite the name of the scale, the items are based on concepts of hardiness and designed to capture the three dispositional tendencies of hardiness – commitment, control, and challenge – as defined by Maddi and Kobasa (1984). There is some confusion between resilience and hardiness in the literature, and whether or not they capture the same concept. At times, they are used interchangeably; at others, they are used as distinct constructs (e.g., Almedom, 2005; Bartone, 2006; Beasley, Thompson, & Davidson, 2003; Gito, Ihara, & Ogata, 2013; Martin, Byrd, Watts, & Dent, 2015). As a result, we did not want to include scales that were theoretically designed to capture another concept. However, based on reviewer comments and the wide knowledge and use of this scale, we collected additional relevance ratings in Study 1 for the DRS.

general public; (b) these measures contained overlapping item content, suggesting that to some extent, we are sampling measures to the point of redundancy; and (c) we must limit the number of items administered, because practically speaking, participant time and attention is also limited.

It is important to note that there are also implicit measures of resilience that attempt to capture resilience indirectly, such as through projective measurement, having participants write stories about adverse events (Strümpfer, 2001), or by seeing how well participants identify themselves with “resilient” qualities (e.g., calm attitudes; Ihaya, Yamada, Kawabe, & Nakamura, 2010). We wish to acknowledge these rare but innovative forms of measurement; in the current study, however, we are focused on the items contained in the most commonly utilized among these various approaches (i.e., self-report resilience measures) and better understanding the substantive resilience themes and factors that these measures are capturing. See Table 1 for information about the set of measures we identified and used, including their definitions of resilience and intended factor structures.

Study 1

Item relevance ratings

First, we recruited six organizational researchers considered subject matter experts (SMEs) in the domain of resilience, asking these SMEs to rate the construct relevance of each of the resilience items, across the 14 measures under study. These SMEs were faculty and graduate students who have published research articles on resilience but have not developed a resilience measure themselves, under the hope they were not particularly invested in one resilience measure over another. We initially reached out to 15 SMEs and received six responses. Although six is a relatively small number of SMEs, the number is not unusual for SME rating tasks of a similar nature (e.g., sorting tasks in job analysis, Biddle, 2009; sorting in educational measurement, Li & Sireci, 2013). Also note that even with this sample of six SMEs, we strove for diverse representation (e.g., half were female; half were professors (associate or full), with the other half being advanced graduate students). The SMEs were compensated with a 25 USD online gift card for their participation.

Prior to the SME rating task, we removed items that were exactly the same or nearly so (e.g., “It does not take me long to recover from a stressful event” and “I tend to recover quickly from stressful events”), which eliminated 105 items from the original 290-item pool, leaving 185 items. The SMEs were then asked to rate these 185 items on how well each item illustrated or captured the concept “resilience” (four-point Likert scale from 1 = Definitely Not to 4 = Definitely; they also flagged items they thought were unclear). These ratings were based on the SME’s own definitions of resilience that they were asked to provide prior to the rating task (see Appendix B), so as not to skew ratings toward any one perspective provided by the authors. This allowed us to acknowledge the various perspectives within this domain and get item relevance ratings across these resilience expert perspectives. In the spirit of the item analysis itself, we wanted to take this descriptive bottom-up approach, rather than a prescriptive top-down approach.

Results

The average relevance rating across the 185 items was 2.10 ($SD = 0.52$), meaning that most items were rated as below average (i.e., below the scale mid-point) in terms of relevance to the concept of resilience. Specifically, 169 items (91%) had at least one rating as “Definitely Not” relevant to resilience, compared to 84 items (45%) with at least one rating as “Definitely” relevant to resilience. Twenty-six (14%) items had at least one rating as an “Unclear Item.” We also calculated the Hinkin Tracey correspondence index for each item, which operationalizes definitional correspondence (content relevance) by dividing the average SME relevance rating by the number of anchors (Colquitt, Sabey, Rodell, & Hill, 2019; Hinkin & Tracey, 1999; see Table 2). This statistic thus quantifies the extent to which an item corresponds to its intended construct; an index of 1 would



Table 1. Resilience measure definitions and factor structures from source articles.

Measure	Definition	Factors
Employee Resilience in Organizations Scale (Amir & Standen, 2012)	"an individual's capacity to respond to adversities at work in ways that strengthen and develop himself or herself as a better person" (p. 5)	Developmental persistency; positive emotion
Baruth Protective Factors Inventory (Baruth & Caroll, 2002)	"encompassing several primary 'protective factors' [including] (a) Compensating Experiences, (b) Fewer Stressors, (c) Supportive Environment, and (d) Adaptable Personality" (p. 235)	Adaptive personality; compensating experiences; fewer stressors; supportive environment
Ego-Resilience Scale (Block & Kremen, 1996)	"the dynamic capacity of an individual to modify a characteristic of ego-control, in either direction, as a function of the demand characteristics of the environmental context, so as to preserve or enhance system equilibrium" (p. 351)	Ego-resiliency
Connor-Davidson Resilience Scale (Connor & Davidson, 2003)	"the personal qualities that enable one to thrive in the face of adversity" (p. 76)	Positive acceptance of change and secure relationships; personal competence, high standards, and tenacity; trust in one's instincts, tolerance of negative affect, and strengthening effects of stress; spiritual influences; control
Five-by-Five Resilience Scale (DeSimone et al., 2017)	"a multi-dimensional construct involving the use of various protective factors [both internal and external] to cope with or overcome adversity" (p. 779)	Adaptability; self-efficacy; emotion regulation; social support; optimism
Resilience Scale for Adults (Friborg et al., 2003)	"individuals who sustain normal development despite long-term stress, adversity, or maltreatment" (p. 65)	Personal structure; personal competence; social competence; social support; family coherence
Resilience Competency Scale (Griffith & West, 2013)	"a dynamic process encompassing positive adaptation within the context of significant adversity" (p. 141)	Self-awareness; mental agility; self-regulation; connection; optimism; character strength
Resilience Appraisal Scale (Johnson et al., 2010)	"the individual's ability to cope with emotions, solve problems, and gain social support" (p. 181)	Situation coping; emotion coping, social support
PsyCap's Resiliency Dimension (Luthans et al., 2007)	"the capacity to rebound or bounce back from adversity, conflict, failure, or even positive events, progress, and increased responsibility" (p. 112)	Resiliency
Employee Resilience Scale (Naswall et al., 2015)	"capacity of employees, facilitated and supported by the organisation, to utilise resources to positively cope, adapt and thrive in response to changing work circumstances" (p. 3)	Resilience
Brief Resilience Coping Scale (Sinclair & Wallston, 2004)	"a dynamic process encompassing positive adaptation within the context of significant adversity" (p. 94)	Resilient coping
Brief Resilience Scale (Smith et al., 2008)	"the ability to bounce back or recover from stress" (p. 194)	Resilience
Resilience Scale (Wagnild & Young, 1993)	"a personality characteristic that moderates the negative effects of stress and promotes adaptation" (p. 165)	Acceptance of self and life; personal competence
Resilience at Work Scale (Winwood et al., 2013)	"identifying those elements of resilience that can be consciously and deliberately considered and modified through appropriate skills training, that is, behaviors and strategies that are not limited by fixed genetic and personality factors" (p. 1206)	Maintaining perspective; living authentically; managing stress; building networks; interacting cooperatively; finding one's calling; staying healthy

Table 2. Relevance ratings for resilience measure items.

Item	Average rating	# of "definitely" ratings	# of "definitely not" ratings	Hinkin Tracey corres. index	Category in Study 2 (SME item sorting)	Factor in Study 3 (Participant responses)
I tend to bounce back after illness or hardship (U1)	3.67	5	0	0.92	BP	
I tend to recover quickly from stressful events	3.67	5	0	0.92	BP	ER
I usually come through difficult times with little trouble (U1)	3.33	3	0	0.83	BP	ER
I can get through difficult times because I've experienced difficulty before	3.33	3	0	0.83		
I feel that I have coped well with one or more major stressors in my life	3.33	3	0	0.83		
Think of self as strong person	3.17	3	1	0.79	SE	A/SE
Adapt easily to new situations	3.17	3	0	0.79	A	
Regardless of what happens to me, I believe I can control my reaction to it	3.17	2	0	0.79	ER	ER
I don't give up when things look helpless	3.17	2	0	0.79	BP	A/SE
At hard times I know that better times will come	3.17	2	0	0.79	O	O
Look for the "silver lining" when confronted with stressful situations	3.17	1	0	0.79	O	
Think clearly and calmly in difficult, stressful situations	3.17	1	0	0.79		
I usually take things in stride	3.00	3	1	0.75		
I have developed some reliable ways to deal with the personal stress of challenging events at work	3.00	2	0	0.75		
I can grow in positive ways by dealing with difficult situations	3.00	2	0	0.75	SE	
Confident in handling stressful circumstances	2.83	3	2	0.71	DP	
Strong sense of purpose	2.83	2	1	0.71		
I usually manage one way or another (U1)	2.83	2	1	0.71	O	
Think positive about myself when challenged (U1)	2.83	2	1	0.71	A	A/SE
I look for creative ways to alter difficult situations	2.83	2	1	0.71	PS	A/SE
I am interested in facing and solving problems	2.83	1	1	0.71		
Coping with stress strengthens (U5)	2.75	1	0	0.69		
I actively look for ways to overcome the challenges I encounter	2.67	2	2	0.67	PS	A/SE
In control of your life	2.67	2	1	0.67	SE	
I quickly get over and recover from being startled	2.67	2	1	0.67	BP	A/SE
I can usually look at a situation in a number of ways	2.67	2	1	0.67	A	
See change as an opportunity	2.67	2	1	0.67	A	A/SE
I am enthusiastic in facing problems rather than avoiding them	2.67	2	1	0.67	PS	A/SE
Am open to change	2.67	1	1	0.67	A	A/SE
See difficulties everywhere	2.67	1	1	0.67	O	ER
Can handle complex problems	2.67	1	1	0.67	SE	
In an emergency, I'm someone people generally can rely on	2.67	1	1	0.67		
I am able to adapt to change	2.67	1	1	0.67	A	A/SE
I am not easily discouraged by failure	2.67	1	1	0.67		
I am usually optimistic and hopeful	2.67	1	1	0.67	O	O

(Continued)

Table 2. (Continued).

Item	Average rating	# of "definitely" ratings	# of "definitely not" ratings	Hinkin Tracey corres. index	Category in Study 2 (SME item sorting)	Factor in Study 3 (Participant responses)
Can tackle anything (U1)	2.67	1	0	0.67	SE	A/SE
Not let negative events get to me	2.50	3	3	0.63	ER	ER
I like challenges	2.50	2	2	0.63	PS	A/SE
Can deal with whatever comes	2.50	1	1	0.63	SE	
I feel that I can handle many things at a time	2.50	1	1	0.63	SE	
Nothing at work ever really "fazes me" for long	2.50	1	1	0.63		
I think about my mistakes and learn from them (U1)	2.50	1	1	0.63	SE	
I believe in my own abilities	2.50	1	1	0.63	PS	A/SE
No matter what happens I always find a solution	2.50	1	1	0.63	SE	A/SE
I know that I can solve my personal problems	2.50	1	1	0.63	SE	A/SE
I do not dwell on things that I can't do anything about	2.33	1	2	0.58		
I feel that there is somebody I can talk to that will listen to my problems and concerns	2.33	1	2	0.58	SS	
I resolve crises competently at work	2.33	1	2	0.58	PS	A/SE
I think how I could have prevented unforeseen problems when they occur	2.33	1	2	0.58		
I always have someone who can help me when needed	2.33	1	2	0.58	SS	SS
I feel I have control over many (but not all) events in my life (U3)	2.33	1	2	0.58		
Best effort no matter what	2.33	1	1	0.58	DP	
Can switch gears easily (U1)	2.33	1	1	0.58	A	A/SE
I am determined	2.33	1	1	0.58	DP	A/SE
Believing in myself helps me to overcome difficult times (U1)	2.33	1	1	0.58	SE	
My future feels promising	2.33	1	1	0.58	DP	
Expect things to fail	2.33	0	1	0.58	O	O
Pride in your achievements (U1)	2.20	1	2	0.55	DP	
Sometimes I make myself do things whether I want to or not	2.17	2	3	0.54	DP	
Identify my strengths and weaknesses	2.17	2	3	0.54	SS	SS
I approach managers when I need their support	2.17	1	3	0.54	DP	
My daily life is full of things that keep me interested	2.17	1	2	0.54	ER	
I get over my anger at someone reasonably quickly	2.17	1	2	0.54	DP	A/SE
I am a goal-oriented person	2.17	1	2	0.54	DP	
I successfully manage a high workload for long periods of time	2.17	1	2	0.54	SE	
I know that I succeed if I carry on (U1)	2.17	1	2	0.54		
I know how to reach my goals	2.17	1	2	0.54		
I have some close friends/family members who are good at encouraging me	2.17	1	2	0.54	SS	SS
I actively look for ways to replace the losses I encounter in life	2.17	0	2	0.54		
Past success gives confidence for new challenge	2.17	1	1	0.54		

(Continued)

Table 2. (Continued).

Item	Average rating	# of "definitely" ratings	# of "definitely not" ratings	Hinkin Tracey corres. index	Category in Study 2 (SME item sorting)	Factor in Study 3 (Participant responses)
I am careful to ensure that my work does not domnaite my personal life	2.17	1	1	0.54		
Know where to turn for help	2.17	0	1	0.54	SS	SS
Look at the bright side of life	2.17	0	1	0.54	O	O
I take things one day at a time	2.17	0	1	0.54		
I can usually find something to laugh about	2.17	0	1	0.54	O	
I can control my emotions	2.17	0	1	0.54	ER	ER
If I were to have problems, I have people I could turn to	2.17	0	1	0.54	SS	
I can handle my emotions	2.17	0	1	0.54	ER	
See things from other people's points of view	2.17	0	1	0.54		
Share frustrations and successes with friends (U1)	2.17	0	1	0.54	SS	SS
Know my thoughts that cause me anxiety	2.17	0	1	0.54		
I am usually confident in doing whatever I choose	2.17	0	1	0.54	SE	ER
I like to do new and different things	2.00	1	3	0.50	A	A/SE
I know my personal strengths and I use them regularly in my work	2.00	1	3	0.50		
I reevaluate my performance and continually improve the way I do my work	2.00	1	3	0.50		
I effectively respond to feedback at work, even criticism	2.00	1	3	0.50		
I seek assistance to work when I need specific resources	2.00	1	3	0.50	SS	SS
I feel that I am competent and have high self esteem (U2)	2.00	1	3	0.50	SE	
See the humorous side of things	2.00	0	3	0.50		
Get overwhelmed by emotions	2.00	1	2	0.50	ER	ER
I complete tasks successfully	2.00	1	2	0.50		
Things happen for a reason	2.00	0	2	0.50		
Don't like the idea of change	2.00	0	2	0.50		
Dislike the unknown	2.00	0	2	0.50		
Am not easily affected by my emotions	2.00	0	2	0.50		
I fear for the worst (U1)	2.00	0	2	0.50		
Have a dark outlook on the future	2.00	0	2	0.50		
Use techniques to relax during stressful circumstances (U1)	2.00	0	2	0.50		
I make sure I take breaks to maintain my strength and energy when I am working hard	2.00	0	2	0.50		
I believe in giving help to my work colleagues, as well as asking for it	2.00	0	2	0.50		
I effectively collaborate with others to handle unexpected challenges at work	2.00	0	2	0.50		
I easily adjust to new social milieus	2.00	0	2	0.50		
There are strong bonds in my family	2.00	0	2	0.50		
I have some friends/family members who back me up (U1)	2.00	0	2	0.50		

(Continued)



Table 2. (Continued).

Item	Average rating	# of "definitely" ratings	# of "definitely not" ratings	Hinkin Tracey corres. index	Category in Study 2 (SME item sorting)	Factor in Study 3 (Participant responses)
I can discuss personal matters with friends/family members	2.00	0	2	0.50		
I have some close friends/family members who value my abilities	2.00	0	2	0.50		
There are strong bonds between my friends	2.00	0	2	0.50		
I am able to depend on myself more than anyone else	2.00	0	1	0.50		
My life has meaning	2.00	0	1	0.50	DP	O
I have enough energy to do what I have to do	2.00	0	1	0.50	DP	
I can generally solve problems that occur	2.00	0	1	0.50	PS	A/SE
Negative people at work tend to pull me down	2.00	0	1	0.50		
Am very sensitive and easily hurt	1.83	1	4	0.46	ER	ER
Identify strengths and weaknesses in others	1.83	1	4	0.46		
I have been able to resolve many (but not all) of my problems by myself (U2)	1.83	1	4	0.46		
When I make plans, I follow through with them	1.83	1	3	0.46	DP	
I am able to change my mood at work when I need to	1.83	1	3	0.46	ER	A/SE
I have realistic plans for the future	1.83	1	3	0.46	DP	
I completely trust my judgments and decisions	1.83	1	3	0.46	SE	ER
Am less capable than most people	1.83	0	3	0.46		
I keep interested in things	1.83	0	3	0.46		
Consider the needs of others	1.83	0	3	0.46		
I have important core values that I hold fast to in my work life	1.83	0	3	0.46		
The work that I do helps to fulfill my sense of purpose in life	1.83	0	3	0.46		
Generally I appreciate what I have in my work environment	1.83	0	3	0.46		
It is important for me to be flexible in social circumstances	1.83	0	3	0.46		
I keep up my daily routines even at difficult times	1.83	0	3	0.46		
I work best when I reach for a goal	1.83	0	3	0.46		
I have at least one person who is interested in my life (whether in your family or not).	1.83	0	3	0.46		
I like to take different paths to familiar places	1.83	0	2	0.46		
Experience my emotions intensely	1.83	0	2	0.46		
I can be on my own if I have to	1.83	0	2	0.46		
It's okay if there are people who don't like me	1.83	0	2	0.46		
My family or friends are very supportive of me (U1)	1.83	0	2	0.46		
When things go wrong at work, it usually tends to overshadow the other parts of my life	1.83	0	2	0.46		
I have friends at work whom I can rely on to support me when I need it	1.83	0	2	0.46		
I often seek feedback on my work from others	1.83	0	2	0.46		
Prefer to take the lead in problem solving	1.67	0	4	0.42		
Excel in what I do	1.67	0	4	0.42		

(Continued)

Table 2. (Continued).

Item	Average rating	# of "definitely" ratings	# of "definitely not" ratings	Hinkin Tracey corres. index	Category in Study 2 (SME item sorting)	Factor in Study 3 (Participant responses)
In my family we have a common understanding of what's important in life	1.67	0	4	0.42		
Close and secure relationships	1.67	0	3	0.42		
Sometimes fate or God can help (U1)	1.67	0	3	0.42		
I am regarded as a very energetic person	1.67	0	3	0.42		
I am more curious than most people	1.67	0	3	0.42		
Feel empty in my relationships	1.67	0	3	0.42		
Feel comfortable around people	1.67	0	3	0.42		
Feel isolated from other people	1.67	0	3	0.42		
I have self-discipline	1.67	0	3	0.42		
I am very willing to acknowledge others' effort and successes in my workplace (U1)	1.67	0	3	0.42		
I am careful about eating well and healthily	1.67	0	3	0.42		
I am pleased with myself	1.67	0	3	0.42		
I am good at getting in touch with new people	1.67	0	3	0.42		
Even at difficult times my family keeps a positive outlook on the future	1.67	0	3	0.42		
I regularly keep in touch with my family	1.67	0	3	0.42		
I am good at organizing my time	1.67	0	3	0.42		
I am friends with myself (U1)	1.67	0	2	0.42		
Make unpopular or difficult decisions (U1)	1.60	0	3	0.40		
I would be willing to describe myself as a pretty "strong" personality (U1)	1.60	0	3	0.40		
Most of the people I meet are likeable	1.50	0	4	0.38		
I usually think carefully about something before acting	1.50	0	4	0.38		
My workplace is somewhere where I feel that I belong	1.50	0	4	0.38		
The work that I do fits well with my personal values and beliefs	1.50	0	4	0.38		
I know how to start a conversation	1.50	0	4	0.38		
I experience good relations with both women and men	1.50	0	4	0.38		
In our family we are loyal toward each other	1.50	0	4	0.38		
In my family we enjoy finding common activities	1.50	0	4	0.38		
I am quickly notified if some family members get into a crisis	1.50	0	4	0.38		
Rules and regular routines make my daily life easier	1.50	0	4	0.38		
I prefer to plan my actions	1.50	0	4	0.38		
Make friends easily	1.50	0	3	0.38		
I seldom wonder what the point of it all is (U2)	1.50	0	3	0.38		
Peers come to me for help and advice	1.50	0	3	0.38		
I have a good level of physical fitness	1.50	0	3	0.38		
I enjoy being with other people	1.50	0	3	0.38		

(Continued)

Table 2. (Continued).

Item	Average rating	# of "definitely" ratings	# of "definitely not" ratings	Hinkin Tracey corres. index	Category in Study 2 (SME item sorting)	Factor in Study 3 (Participant responses)
I enjoy being with my family	1.50	0	3	0.38		
There are few conflicts in my family	1.33	0	5	0.33		
I am generous with my friends	1.33	0	4	0.33		
I usually succeed in making a favorable impression on people	1.33	0	4	0.33		
It is easy for me to make other people laugh	1.33	0	4	0.33		
There have been more problems than positive experiences with my health status in the last 3 months	1.33	0	4	0.33		
Most people think I'm friendly and like to be around me	1.33	0	4	0.33		
Have to act on a hunch (U1)	1.20	0	4	0.30		
There have been more problems than positive experiences with my finances in the past 3 months	1.17	0	5	0.29		
There have been more problems than positive experiences with my family/friends in the past 3 months	1.17	0	5	0.29		
There have been more problems than positive experiences with my work/school in the past 3 months	1.17	0	5	0.29		
Average values (Standard deviation)	2.10 (0.52)	0.68 (0.94)	2.14 (1.25)	0.53 (0.13)		

Note. (U#) represents items where one or more raters marked the item as unclear, where the number represents the number of raters who marked the item as unclear. From Study 2, SE = self-efficacy, SS = social support, ER = emotion regulation, DP = determination/purpose, A = adaptability, O = optimism, PS = problem-solving, BP = behavioral persistence. From Study 3, A/SE = adaptability/self-efficacy, ER = emotion regulation, O = optimism, SS = social support.

mean that all experts agree that the item is construct-relevant and lower index values indicate less relevance. The average Hinkin Tracey correspondence index for the items was .53 ($SD = 0.13$). Overall, these numbers demonstrate the disagreement among resilience SMEs about whether current resilience measure items are considered relevant to the construct.

We did not originally include the Dispositional Resilience Scale (DRS; Bartone et al., 1989) in Study 1 because the theoretical basis of this scale focuses on the concept of hardiness (Maddi & Kobasa, 1984; see Footnote 1). However, based on reviewer comments and the popular use of this scale, we conducted a second round of SME relevance ratings specifically for the DRS. We reached out to the original SMEs from Study 1 and received three responses. The average Hinkin Tracey correspondence index for the DRS was .37, which was the lowest measure average, compared to the other included measures (see Tables 3 and 4). As a result, this provided additional support for our decision to exclude the DRS in this assessment of resilience-related measures.

Study 2

Item sorting task

From Study 1, we retained the 84 items that at least one of the six SMEs rated as “Definitely” relevant, in addition to the 17 items that only one SME rated “Definitely Not” relevant. We then removed the two items that half or more of the SMEs rated as “Unclear.” This resulted in a total of 99 items (54% of the original 185) for use in the item sorting task. We again recruited SMEs in the organizational sciences who have conducted research in the resilience domain but have not authored a resilience measure. These SMEs were different than those in Study 1. We reached out to 54 SMEs and received 16 responses. These 16 SMEs were predominantly female (81%) and white (78%), with half being professors (assistant, associate, or full) and the other half graduate students, post-doctoral fellows, or non-academic research psychologists. Each of the SMEs categorized the 99 items into as many (or as few) categories as they thought fitting based on item similarity, and they were then asked to label the categories they created. Item sorts were conducted using an online card sorting platform called Proven by Users (<https://provenbyusers.com/>). The SMEs were compensated with a 25 USD online gift card for their participation.

Results

The SMEs created their own categories for the items they sorted, and they labeled those categories however they thought most fitting; in other words, we intentionally did not put any constraints on whether or how SMEs thought items belonged together. We then sought to determine what a consensus category structure of the set of resilience items would look like, and in doing so, we took a more objective empirical approach. Therefore, we generated an item-by-item agreement matrix, where each cell reflected the proportion of SMEs who indicated that two respective items were placed into the same category (even if SMEs gave the category a different name). Because proportions range from 0 to 1, the matrix behaves like a correlation matrix and can be analyzed using a principal components analysis (PCA), as long as the matrix is positive definite. The PCA components that we extract and varimax-rotate reflect what the item ratings have in common across SMEs. Incidentally, we did not use factor analysis here because raters are grouping items, not responding to each item, making PCA the more appropriate quantitative summary tool.

To determine the number of components to extract from the PCA, we compared our obtained scree plot to the scree plot from parallel analysis (PCA based on randomly generated data Cattell, 1966; Horn, 1965). From these results, and in an exploratory vein, we examined varimax-rotated principal components solutions between five components (just above where the parallel analysis plot crosses the scree plot) and eight components (just above the elbow in the scree plot), inclusive. Based on the item content, the five-component rotated solution represented self-

Table 3. Relevance ratings for the dispositional resilience scale.

Item	Average rating	# of "definitely" ratings	# of "definitely not" ratings	Hinkin Tracey correspondence index
It's usually impossible for me to change things at work	2.33	0	0	0.58
No matter how hard I try, my efforts usually accomplish nothing	2.33	0	0	0.58
My mistakes are usually very difficult to correct	2.33	0	0	0.58
I can't do much to prevent it if someone wants to harm me	2.33	0	0	0.58
It's best to handle most problems by just not thinking of them	2.33	0	0	0.58
I won't answer a question until I'm really sure I understand it	2.33	0	0	0.58
When I make plans, I'm certain I can make them work	2.00	0	1	0.50
It's exciting to learn something about myself	2.00	0	0	0.50
Planning ahead can help avoid most future problems	2.00	0	0	0.50
It's hard to imagine anyone getting excited about working	2.00	0	1	0.50
The "tried and true" ways are always best (U1)	2.00	0	0	0.50
People who never change their minds usually have good judgment	2.00	0	1	0.50
I like a lot of variety in my work	2.00	0	1	0.50
Daydreams are more exciting than reality for me	2.00	0	1	0.50
Most of what happens in life is just meant to be	1.67	0	1	0.42
If I'm working on a difficult task, I know when to seek help	1.67	0	1	0.42
Lots of times, I don't really know my own mind (U1)	1.67	0	2	0.42
Most working people are simply manipulated by their bosses (U1)	1.67	0	2	0.42
I respect rules because they guide me	1.67	0	2	0.42
I have no use for theories that are not closely tied to facts	1.67	0	2	0.42
I want to be sure someone will take care of me when I'm old	1.67	0	1	0.42
Trying hard doesn't pay, since things still don't turn out right (U1)	1.33	0	2	0.33
By working hard you can always achieve your goals	1.33	0	2	0.33
Changes in routine are interesting to me	1.33	0	2	0.33
I really look forward to my work	1.33	0	2	0.33
People who believe in individuality are only kidding themselves (U1)	1.33	0	2	0.33
I like it when things are uncertain or unpredictable	1.00	0	3	0.25
It bothers me when my daily routine gets interrupted	1.00	0	3	0.25
I often wake up eager to take up my life wherever it left off (U1)	1.00	0	3	0.25
I don't like to make changes in my everyday schedule	1.00	0	3	0.25
If someone gets angry at me, it's usually no fault of mine	1.00	0	3	0.25
Trying your best at work really pays off in the end	1.00	0	3	0.25
Most days, life is really interesting and exciting for me (U1)	1.00	0	3	0.25
What happens to me tomorrow depends on what I do today	1.00	0	3	0.25
Most of my life gets spent doing things that are worthwhile	1.00	0	3	0.25

(Continued)

Table 3. (Continued).

Item	Average rating	# of "definitely" ratings	# of "definitely not" ratings	Hinkin Tracey correspondence index
Working hard doesn't matter, since only the bosses profit by it	1.00	0	3	0.25
It's very hard for me to change a friend's mind about something	1.00	0	3	0.25
New laws should never hurt a person's paycheck	1.00	0	3	0.25
Politicians run our lives	1.00	0	3	0.25
Most of the time, people listen carefully to what I say	1.00	0	3	0.25
Thinking of yourself as a free person just leads to frustration	1.00	0	3	0.25
Most good athletes and leaders are born, not made (U1)	1.00	0	3	0.25
People who do their best should get full support from society (U1)	1.00	0	3	0.25
It's hard to believe people who say their work helps society	1.00	0	3	0.25
Ordinary work is just too boring to be worth doing	1.00	0	3	0.25
Average values (Standard deviation)	1.50 (0.51)	0.00 (0.00)	1.84 (1.19)	0.37 (0.13)

Note. (U#) represents items where one or more raters marked the item as unclear, where the number represents the number of raters who marked the item as unclear.

Table 4. Average Hinkin Tracey correspondence index by measure.

Item	Average Hinkin Tracey correspondence index (Standard deviation)
Brief Resilience Scale (Smith et al., 2008)	0.89 (0.05)
PsyCap's Resiliency Dimension (Luthans et al., 2007)	0.70 (0.14)
Brief Resilience Coping Scale (Sinclair & Wallston, 2004)	0.70 (0.11)
Employee Resilience in Organizations (Amir & Standen, 2012)	0.69 (0.13)
Connor-Davidson Resilience Scale (Connor & Davidson, 2003)	0.59 (0.15)
Resilience Competency Scale (Griffith & West, 2013)	0.57 (0.12)
Resilience Scale (Wagnild & Young, 1993)	0.55 (0.11)
Employee Resilience Scale (Naswall et al., 2015)	0.55 (0.06)
Resilience Appraisal Scale (Johnson et al., 2010)	0.54 (0.05)
Five-by-Five Resilience Scale (DeSimone et al., 2017)	0.53 (0.10)
Resilience at Work Scale (Winwood et al., 2013)	0.48 (0.09)
Resilience Scale for Adults (Friborg et al., 2003)	0.47 (0.10)
Ego-Resiliency Scale (Block & Kremen, 1996)	0.46 (0.09)
Baruth Protective Factors Inventory (Baruth & Caroll, 2002)	0.45 (0.14)
Dispositional Resilience Scale (Bartone et al., 1989)	0.37 (0.13)

Note. The average Hinkin Tracey correspondence index for each measure was calculated by averaging the Hinkin Tracey correspondence index for all the items in the measure. It is important to note that, for items that were removed before Study 1 for redundancy, the Hinkin Tracey statistics for the item that was retained was substituted. As a result, these average values should be read as a rough estimate but not used as a definitive ranking or comparison of the presented scales.

efficacy, social support, emotion regulation, determination/purpose, and optimism; the six-component solution represented the five components plus adaptability; the seven-component solution represented the six components plus problem-solving; and eight-component solution had factors that seemed to represent the seven components plus behavioral persistence.² We adopted the eight-factor solution, because previous factor analysis work has argued that over-

²It is useful to compare PCA solutions and explain how we arrived at the eight-component solution. The six-component solution contained a new adaptability component (derived from items previously loading on determination/purpose, emotion regulation, and optimism components in simpler solutions). The seven-component solution contained a new problem-solving component (derived from items with low loadings in simpler solutions). The eight-component solution contained a new behavioral persistence component (derived from

extraction is generally more favorable than under-extraction (e.g., Fava & Velicer, 1992). Also, for our purposes, it would be much easier to merge components together once identified (e.g., when aligning these components with the factor analysis of data in Study 3) than to pull broad components apart once established.

Table 5 presents the item pool, how they sorted into the eight components of self-efficacy, social support, emotional regulation, determination/purpose, adaptability, optimism, problem-solving, and behavioral persistence, as well as the average Hinkin Tracey correspondence index for the components (values taken from Study 1). Interestingly, the behavioral persistence component had the highest Hinkin Tracey correspondence index (.83) when compared to all the other components (.55 to .66). Although these indices are not compared for statistical significance, the pattern of results here indicates that the items in the behavioral persistence component were judged to be the most relevant to the construct of resilience, and it is possible that the other components may be related to but potentially distinct from resilience. At the item level, four of the 12 items with the highest Hinkin Tracey correspondence indices from Study 1 were in the behavioral persistence component (see Table 2); however, the other items with the highest Hinkin Tracey correspondence indices were scattered across the self-efficacy, adaptability, emotion regulation, and optimism components, and three of the 12 items did not sort into any component from the sort.

Study 3

Factor analysis and convergent/discriminant validity

Study 3 consists of participants who were administered the items that loaded onto the factors that arose from identifying, sorting, and analyzing 14 publicly available resilience measures in Study 1 and 2. We recruited 218 online participants from Prolific who are currently employed (69% full-time), 55% male, and 31.0 years old on average ($SD = 9.28$). This was an international sample; 34% of the participants reported English as their first language, and the majority of participants were from the United Kingdom (25%), Poland (19%), United States (9%), and Portugal (9%). Participants completed a refined set of the resilience items from Study 2, as well as established measures for constructs related to the categories identified in Study 2 (i.e., self-efficacy, optimism, social support, emotion regulation, adaptability) and a measure of the Big Five personality traits. Participants were compensated 5.79 USD through Prolific, and because the average amount of time spent on the survey was about 30 minutes ($M = 29.4$, $SD = 14.7$), this ensured that all participants were paid above the platform's minimum wage (\$6.50 per hour).

Measures

Resilience items

Based on the eight-component solution from Study 2, we retained 7 items per component (5 for behavioral persistence), keeping items with the highest component loadings, which resulted in 54 retained items. All of the items were on a seven-point Likert scale from strongly disagree to strongly agree. Cronbach's alpha for the items were generally high (overall $\alpha = .96$, and for the components: self-efficacy $\alpha = .88$, social support $\alpha = .84$, emotional regulation $\alpha = .76$, determination/purpose $\alpha = .84$, adaptability $\alpha = .86$, optimism $\alpha = .82$, problem-solving $\alpha = .88$, and behavioral persistence $\alpha = .76$).

items with low loadings in simpler solutions). Note that we also examined the utility of a nine-component solution, but the new component that emerged was hard to distinguish from the two existing components of determination/purpose and optimism.

Table 5. factor loadings from principal components analysis for the open sort.

Item	SE	SS	ER	DP	A	O	PS	BP
I am usually confident in doing whatever I choose	-0.28	0.01	0.02	0.02	0.01	-0.01	-0.01	-0.01
I completely trust my judgments and decisions	-0.28	0.01	0.02	0.01	0.01	0.00	0.00	0.00
I believe in my own abilities	-0.26	0.00	-0.02	-0.05	-0.01	0.01	0.06	0.01
Can tackle anything	-0.25	0.01	0.03	0.03	0.00	-0.02	-0.04	0.02
I know that I can solve my personal problems	-0.25	0.00	-0.01	0.00	-0.01	0.01	-0.02	0.04
I feel that I am competent and have high self esteem	-0.25	0.03	0.04	0.00	0.02	-0.07	-0.03	-0.04
Think of self as strong person	-0.24	0.02	0.02	0.01	-0.01	-0.04	0.01	-0.09
Believing in myself helps me to overcome difficult times	-0.22	0.00	-0.03	0.03	0.04	-0.11	0.02	-0.03
Can handle complex problems	-0.21	0.04	0.01	-0.01	0.01	-0.02	-0.17	0.06
Confident in handling stressful circumstances	-0.21	-0.01	0.00	0.05	0.02	-0.04	-0.06	-0.06
I feel that I can handle many things at a time	-0.21	-0.01	0.00	-0.03	-0.07	0.06	0.08	0.04
I know that I succeed if I carry on	-0.20	-0.02	-0.02	-0.06	0.02	0.04	0.04	0.01
Can deal with whatever comes	-0.18	-0.04	-0.03	0.05	-0.05	0.04	0.03	-0.06
In control of your life	-0.18	-0.04	-0.02	-0.04	0.01	0.02	0.08	0.05
I feel that there is somebody I can talk to that will listen to my problems and concerns	0.02	0.33	-0.01	0.00	0.02	0.00	0.01	-0.02
I have some close friends/family members who are good at encouraging me	0.02	0.33	-0.01	0.00	0.02	0.00	0.01	-0.02
If I were to have problems, I have people I could turn to	0.02	0.33	-0.01	0.00	0.02	0.00	0.01	-0.02
I always have someone who can help me when needed	0.02	0.32	-0.01	0.00	-0.01	0.00	0.01	-0.02
Know where to turn for help	0.01	0.29	-0.03	0.04	-0.01	0.02	0.00	0.01
I approach managers when I need their support	0.02	0.29	-0.03	0.04	0.04	0.02	-0.01	0.03
Share frustrations and successes with friends	0.02	0.28	-0.02	0.03	0.03	0.01	-0.01	0.02
I seek assistance to work when I need specific resources	0.01	0.27	-0.03	0.05	0.00	0.02	0.01	0.04
I can control my emotions	0.00	-0.01	0.35	0.02	0.01	0.03	0.00	-0.02
I can handle my emotions	0.00	-0.01	0.35	0.02	0.01	0.03	0.00	-0.02
Get overwhelmed by emotions	0.00	0.00	0.32	0.02	0.01	-0.02	-0.01	0.01
I am able to change my mood at work when I need to	0.01	-0.02	0.31	0.03	-0.02	0.02	0.01	-0.05
Item	SE	SS	ER	DP	A	O	PS	BP
I get over my anger at someone reasonably quickly	0.01	-0.01	0.31	0.02	0.02	0.00	0.00	-0.07
Am very sensitive and easily hurt	0.01	-0.01	0.30	0.03	0.02	-0.01	-0.01	-0.02
Regardless of what happens to me, I believe I can control my reaction to it	-0.02	-0.04	0.23	-0.03	-0.03	0.04	0.06	0.03
Not let negative events get to me	-0.01	-0.03	0.20	0.04	0.01	-0.14	0.02	0.12
Strong sense of purpose	0.02	-0.01	-0.05	-0.30	0.02	-0.03	0.01	-0.07
I am a goal-oriented person	0.04	-0.06	0.00	-0.27	0.02	0.13	-0.01	0.08
I have realistic plans for the future	0.00	-0.05	-0.01	-0.26	0.00	0.08	0.05	0.06
My life has meaning	0.01	-0.02	-0.07	-0.25	0.01	-0.09	0.04	-0.06
When I make plans, I follow through with them	0.03	-0.06	0.00	-0.24	0.02	0.13	0.00	0.08
I am determined	0.01	0.00	0.02	-0.24	0.05	-0.02	-0.15	-0.05
My future feels promising	-0.04	0.02	-0.06	-0.23	-0.04	-0.16	0.05	-0.10
Sometimes I make myself do things whether I want to or not	0.04	-0.05	-0.03	-0.22	0.02	0.05	0.03	0.07
Best effort no matter what	0.01	-0.01	0.02	-0.20	0.03	0.02	-0.04	-0.07
My daily life is full of things that keep me interested	0.03	-0.02	-0.08	-0.19	-0.07	-0.12	0.07	-0.09
Pride in your achievements	-0.09	0.00	0.01	-0.19	0.04	-0.01	-0.01	0.02
I have enough energy to do what I have to do	0.01	0.01	-0.03	-0.19	-0.05	-0.08	0.05	-0.17
I am able to adapt to change	-0.03	0.00	0.01	0.00	-0.40	0.02	0.03	0.02
Am open to change	0.00	0.00	0.00	-0.02	-0.40	0.01	0.05	0.03
Adapt easily to new situations	0.01	-0.03	-0.01	0.07	-0.38	0.03	-0.02	-0.06
Can switch gears easily	-0.08	0.00	0.05	0.04	-0.32	0.00	0.03	0.03
I like to do new & different things	0.01	0.02	-0.01	-0.06	-0.32	-0.06	-0.06	-0.02
See change as an opportunity	0.02	-0.02	-0.02	-0.02	-0.26	-0.02	-0.09	0.06
I look for creative ways to alter difficult situations	0.03	-0.10	-0.06	0.14	-0.22	0.11	0.03	-0.03
I can usually look at a situation in a number of ways	0.02	-0.07	-0.05	0.12	-0.22	0.05	-0.01	-0.06
Look at the bright side of life	0.00	-0.03	0.00	0.04	0.02	-0.38	0.01	0.09
At hard times I know that better times will come	0.02	-0.07	-0.09	0.04	0.05	-0.32	0.07	0.04
See difficulties everywhere	0.00	0.02	0.06	0.00	-0.03	-0.31	-0.12	-0.08
I am usually optimistic and hopeful	0.02	-0.02	0.01	-0.08	0.00	-0.30	0.03	-0.02
I can usually find something to laugh about	0.02	-0.05	0.02	0.00	0.01	-0.30	0.09	0.17
Expect things to fail	-0.03	0.03	0.04	-0.02	-0.04	-0.25	-0.12	-0.15
Think positive about myself when challenged	-0.06	-0.03	-0.06	0.06	0.04	-0.25	-0.10	0.11
Look for the "silver lining" when confronted with stressful situations	0.02	-0.09	-0.06	0.10	0.00	-0.18	0.08	0.21

(Continued)

Table 5. (Continued).

Item	SE	SS	ER	DP	A	O	PS	BP
Item	SE	SS	ER	DP	A	O	PS	BP
I am enthusiastic in facing problems rather than avoiding them	0.03	-0.01	-0.01	0.01	-0.01	-0.01	-0.39	-0.03
I am interested in facing and solving problems	0.04	0.00	0.00	-0.04	-0.05	0.00	-0.37	0.07
I like challenges	0.04	-0.01	0.02	-0.08	0.00	-0.04	-0.36	0.02
I actively look for ways to overcome the challenges I encounter	0.04	-0.03	-0.05	0.06	-0.02	-0.04	-0.34	-0.05
I can generally solve problems that occur	-0.17	0.03	0.02	-0.05	0.02	0.03	-0.20	0.08
No matter what happens I always find a solution	-0.10	0.02	0.00	0.03	-0.09	0.01	-0.19	-0.05
I resolve crises competently at work	-0.10	-0.03	-0.03	0.11	0.10	0.09	-0.19	0.07
I tend to bounce back after illness or hardship	-0.03	-0.09	-0.02	0.06	0.09	0.03	0.03	-0.34
I tend to recover quickly from stressful events	0.02	-0.08	0.11	0.02	0.04	-0.01	0.02	-0.26
I quickly get over and recover from being startled	0.04	-0.08	0.10	0.03	0.02	-0.01	0.02	-0.26
I don't give up when things look helpless	0.00	-0.04	-0.06	-0.11	-0.04	-0.05	-0.01	-0.25
I usually come through difficult times with little trouble	-0.06	-0.09	-0.06	0.03	0.00	-0.01	0.06	-0.22
I feel that I have coped well with one or more major stressors in my life	-0.08	-0.08	-0.06	0.10	0.12	0.02	0.06	-0.13
I can get through difficult times because I've experienced difficulty before	-0.10	-0.12	-0.13	0.13	0.11	0.03	0.09	-0.10
I can grow in positive ways by dealing with difficult situations	0.01	-0.10	-0.10	0.14	0.01	-0.07	-0.12	-0.05
Think clearly and calmly in difficult, stressful situations	0.04	-0.11	0.11	0.10	0.04	0.11	0.01	-0.05
I am not easily discouraged by failure	-0.10	-0.02	-0.03	-0.09	0.03	-0.06	-0.04	-0.03
I am able to depend on myself more than anyone else	-0.11	0.13	-0.02	0.00	0.02	-0.03	-0.01	-0.03
I usually manage one way or another	-0.13	-0.02	0.02	0.02	-0.08	0.06	-0.02	-0.02
I have been able to resolve many (but not all) of my problems by myself	-0.06	0.01	-0.07	0.10	0.10	0.03	-0.03	0.00
I usually take things in stride	0.04	-0.06	0.11	-0.05	0.04	0.01	-0.09	0.00
Nothing at work ever really "fazes me" for long	-0.01	-0.03	0.12	-0.04	-0.02	0.00	-0.02	0.01
I have developed some reliable ways to deal with the personal stress of challenging events at work	0.02	-0.07	-0.10	0.16	0.06	0.02	0.03	0.01
Item	SE	SS	ER	DP	A	O	PS	BP
Past success gives confidence for new challenge	-0.12	-0.07	-0.07	0.04	0.03	0.04	0.01	0.03
I think about my mistakes and learn from them	0.04	-0.12	-0.09	0.09	-0.01	0.04	-0.11	0.05
In an emergency, I'm someone people generally can rely on	-0.06	0.11	0.01	0.04	-0.01	0.07	0.05	0.06
Know my thoughts that cause me anxiety	-0.06	0.01	0.13	0.00	0.01	-0.11	0.02	0.09
I know my personal strengths and I use them regularly in my work	-0.12	-0.02	-0.01	-0.04	-0.05	0.03	0.12	0.09
I know how to reach my goals	-0.13	-0.03	0.01	-0.15	0.01	0.11	0.03	0.10
I think how I could have prevented unforeseen problems when they occur	0.06	-0.07	-0.05	0.04	0.03	0.09	-0.14	0.10
I successfully manage a high workload for long periods of time	-0.07	-0.06	-0.02	-0.07	0.05	0.15	0.04	0.10
I reevaluate my performance and continually improve the way I do my work	0.06	-0.13	-0.08	0.08	0.05	0.11	-0.14	0.10
Identify strengths and weaknesses in others	0.01	-0.01	-0.05	0.02	-0.02	0.00	-0.02	0.12
I complete tasks successfully	-0.11	0.00	0.03	-0.13	0.02	0.08	-0.15	0.13
Identify my strengths and weaknesses	-0.03	-0.05	-0.07	-0.02	0.03	0.00	0.00	0.13
See things from other people's points of view	0.00	0.00	-0.06	-0.01	-0.15	-0.02	0.12	0.14
I effectively respond to feedback at work, even criticism	0.00	-0.06	0.05	0.02	0.00	-0.05	-0.04	0.14
I am careful to ensure that my work does not dominate my personal life	0.05	-0.09	-0.08	0.02	0.09	0.03	0.09	0.15
I take things one day at a time	0.03	-0.05	0.08	-0.14	0.01	0.04	-0.02	0.16
Negative people at work tend to pull me down	0.02	0.01	0.15	0.08	0.06	-0.04	0.06	0.18
I do not dwell on things that I can't do anything about	0.00	-0.07	0.05	0.01	0.00	-0.12	0.10	0.25
Average Hinkin Tracey correspondence index	0.62	0.55	0.56	0.55	0.66	0.66	0.63	0.83

Note. SE = self-efficacy, SS = social support, ER = emotion regulation, DP = determination/purpose, A = adaptability, O = optimism, PS = problem-solving, BP = behavioral persistence. The average Hinkin Tracey correspondence index for each component was calculated using the item-level Hinkin Tracey correspondence statistics from Study 1.

Big Five personality traits

The Big Five personality traits (openness, conscientiousness, extraversion, agreeableness, neuroticism) were measured using the 20-item Mini-IPIP (Donnellan, Oswald, Baird, & Lucas, 2006), with 4 items per Big 5 trait. Sample items include "Am not interested in abstract ideas" (openness – reverse coded), "Like order" (conscientiousness), "Am the life of the party" (extraversion), "Am not

interested in other people's problems" (agreeableness – reverse coded), and "Have frequent mood swings" (neuroticism). Cronbach's alpha was reasonable, but ideally would be higher for the conscientiousness and neuroticism scales (openness was $\alpha = .74$; conscientiousness, $\alpha = .64$; extraversion, $\alpha = .80$; agreeableness, $\alpha = .80$; neuroticism, $\alpha = .64$). Nonetheless, we believed these reliabilities were high enough to investigate correlational patterns of convergent and discriminant validity (versus making individual predictions).

Self-efficacy

Self-efficacy was measured using Chen, Gully, and Eden's (2001) 8-item self-efficacy scale. Sample items include "I will be able to achieve most of the goals that I have set for myself" and "I will be able to successfully overcome many challenges." Cronbach's alpha was high ($\alpha = .92$).

Optimism

Optimism was measured using the 8-item Life Orientation Test (Scheier & Carver, 1985). Sample items include "In uncertain times, I usually expect the best" and "I hardly ever expect things to go my way" (reverse coded). Cronbach's alpha in this study was high ($\alpha = .86$).

Social support

Social support was measured using the 12-item Multidimensional Scale of Perceived Social Support (Zimet, Dahlem, Zimet, & Farley, 1988). Sample items include "There is a special person who is around when I am in need" and "I can talk about my problems with my friends." Cronbach's alpha in this study was high ($\alpha = .92$).

Emotion regulation

Emotion regulation was measured using the 18-item Difficulties in Emotion Regulation Scale – Short Form (Kaufman et al., 2016). Sample items include "I pay attention to how I feel" and "When I'm upset, I acknowledge my emotions." Cronbach's alpha in this study was high ($\alpha = .91$).

Adaptability

Adaptability was measured using the 9-item uncertainty subscale of the I-ADAPT adaptability scale (Ployhart & Bliese, 2006). Sample items include "I become frustrated when things are unpredictable" and "I can adapt to changing situations." Cronbach's alpha in this study was high ($\alpha = .81$).

Results

Using the eight factors from the resilience items sorted by experts in Study 2, the CFA did not fit well to the data from this study; the comparative fit index for the model was .77, below the general threshold of .95 for acceptable fit (Schreiber, Nora Stage, Barlow, & King, 2006). Due to the poor fit of the CFA model to the data, a follow-up exploratory factor analysis (EFA) was conducted to determine how the items grouped together, based on data from participant responses; then we assessed how the EFA factors aligned (or did not align) with the SME sorted categories.

To determine the number of factors for the EFA, we used both a scree plot and parallel analysis (Cattell, 1966; Horn, 1965) in the same manner as before, which suggested one and four factors, respectively. Again, we erred on the side of over-extraction and adopted a four-factor varimax-rotated solution. Based on statistical guidance from Stevens (2002), when examining the four factors, we retained items greater than .364 and excluded items that had relatively large cross-loadings across multiple factors. Using the item content in the factors, the four factors were determined to represent adaptability/self-efficacy, emotion regulation, optimism, and social support. These factors generally aligned with the categories formed from the SME item sorting procedure in Study 2 (see Table 6). Specifically, the EFA optimism factor aligns with the SME optimism component from the item sorting; the EFA social support factor aligns with the SME social support component; and the EFA

Table 6. Standardized factor loadings from exploratory factory analysis.

Item	Category from Study 2 (SME item sorting)	Factor 1: Adaptability/ Self-efficacy	Factor 2: Emotion regulation	Factor 3: Optimism	Factor 4: Social support
See change as an opportunity	Adaptability	0.64	0.20	0.18	0.07
I look for creative ways to alter difficult situations	Adaptability	0.61	0.28	0.17	0.23
Can switch gears easily	Adaptability	0.57	0.31	0.21	0.14
<i>Adapt easily to new situations</i>	<i>Adaptability</i>	<i>0.56</i>	<i>0.39</i>	<i>0.13</i>	<i>0.14</i>
Am open to change	Adaptability	0.54	0.23	0.22	0.09
I like to do new and different things	Adaptability	0.52	0.18	0.11	0.24
I am able to adapt to change	Adaptability	0.51	0.35	0.29	0.12
I like challenges	Problem-solving	0.74	0.05	0.09	0.15
I actively look for ways to overcome the challenges I encounter	Problem-solving	0.70	0.19	0.24	0.33
I am interested in facing and solving problems	Problem-solving	0.65	0.05	0.25	0.17
No matter what happens I always find a solution	Problem-solving	0.60	0.36	0.18	0.27
I can generally solve problems that occur	Problem-solving	0.58	0.35	0.11	0.31
I am enthusiastic in facing problems rather than avoiding them	Problem-solving	0.57	0.28	0.36	0.13
I resolve crises competently at work	Problem-solving	0.56	0.27	0.14	0.19
I am determined	Determination/ purpose	0.63	0.14	0.14	0.25
I am a goal-oriented person	Determination/ purpose	0.60	0.13	0.33	0.05
<i>My future feels promising</i>	<i>Determination/ purpose</i>	<i>0.44</i>	<i>0.23</i>	<i>0.49</i>	<i>0.18</i>
<i>Strong sense of purpose</i>	<i>Determination/ purpose</i>	<i>0.43</i>	<i>0.23</i>	<i>0.45</i>	<i>0.29</i>
My life has meaning	Determination/ purpose	0.30	0.06	0.63	0.29
I have realistic plans for the future	Determination/ purpose	0.31	0.12	0.33	0.27
When I make plans, I follow through with them	Determination/ purpose	0.32	0.24	0.14	0.25
Can tackle anything	Self-efficacy	0.54	0.35	0.11	0.21
Think of self as strong person	Self-efficacy	0.50	0.35	0.33	0.20
I know that I can solve my personal problems	Self-efficacy	0.44	0.34	0.26	0.18
<i>I believe in my own abilities</i>	<i>Self-efficacy</i>	<i>0.44</i>	<i>0.55</i>	<i>0.26</i>	<i>0.17</i>
<i>I feel that I am competent and have high self esteem.</i>	<i>Self-efficacy</i>	<i>0.39</i>	<i>0.62</i>	<i>0.25</i>	<i>0.27</i>
I am usually confident in doing whatever I choose	Self-efficacy	0.31	0.59	0.26	0.18
I completely trust my judgments and decisions	Self-efficacy	0.31	0.52	0.22	0.14
I am able to change my mood at work when I need to	Emotion regulation	0.38	0.25	0.24	0.17
I can control my emotions	Emotion regulation	0.14	0.59	0.22	0.08
Not let negative events get to me	Emotion regulation	0.12	0.58	0.36	0.13
Get overwhelmed by emotions	Emotion regulation	0.06	0.57	0.00	-0.08
Am very sensitive and easily hurt	Emotion regulation	0.09	0.51	-0.02	0.03
Regardless of what happens to me, I believe I can control my reaction to it	Emotion regulation	0.34	0.48	0.24	0.03
I get over my anger at someone reasonably quickly	Emotion regulation	0.18	0.22	-0.04	0.05
I don't give up when things look helpless	Behavioral persistence	0.64	0.26	0.33	0.21
I quickly get over and recover from being startled	Behavioral persistence	0.43	0.35	0.15	0.08
I tend to recover quickly from stressful events	Behavioral persistence	0.26	0.47	0.29	0.20
I usually come through difficult times with little trouble	Behavioral persistence	0.32	0.41	0.13	0.11
I tend to bounce back after illness or hardship	Behavioral persistence	0.23	0.19	0.24	0.17

(Continued)

Table 6. (Continued).

Item	Category from Study 2 (SME item sorting)	Factor 1: Adaptability/ Self-efficacy	Factor 2: Emotion regulation	Factor 3: Optimism	Factor 4: Social support
<i>Think positive about myself when challenged</i>	<i>Optimism</i>	0.42	0.48	0.35	0.20
See difficulties everywhere	Optimism	0.21	0.42	0.27	0.13
Look at the bright side of life	Optimism	0.15	0.26	0.80	0.18
I am usually optimistic and hopeful	Optimism	0.31	0.13	0.79	0.12
At hard times I know that better times will come	Optimism	0.29	0.24	0.46	0.25
Expect things to fail	Optimism	0.15	0.32	0.40	0.09
I can usually find something to laugh about	Optimism	0.30	0.26	0.20	0.16
I feel that there is somebody I can talk to that will listen to my problems and concerns	Social support	0.16	0.09	0.09	0.85
I have some close friends/family members who are good at encouraging me	Social support	0.14	-0.01	0.14	0.77
I always have someone who can help me when needed	Social support	0.11	0.08	0.09	0.68
Share frustrations and successes with friends	Social support	0.24	-0.01	0.15	0.56
Know where to turn for help	Social support	0.36	0.25	0.14	0.54
I approach managers when I need their support	Social support	0.14	0.24	0.21	0.51
I seek assistance to work when I need specific resources	Social support	0.22	0.12	0.14	0.33
Average Hinkin Tracey correspondence index		0.63	0.63	0.62	0.54

Note. Bold = included in the factor; italicized = excluded because cross-loaded onto multiple factors; plain = did not load high enough to be included in a factor. The average Hinkin Tracey correspondence index for each component was calculated using the item-level Hinkin Tracey correspondence statistics from Study 1.

emotion regulation factor captures most of the SME emotion regulation component, in addition to some of the items in the SME self-efficacy and behavioral persistence components. The EFA adaptability/self-efficacy factor showed less alignment with the SME sorting and was an amalgamation of a few of the SME components (which likely is the source of the poor fit of the original CFA); although this EFA factor captured most of the items in the SME adaptability and problem-solving components, it also captured some of the items in the SME self-efficacy, determination/purpose, and behavioral persistence components. It is also interesting to note that when looking back at the 12 items with the highest Hinkin Tracey correspondence indices from the SME relevance ratings in Study 1, six of these 12 items did not load onto factors in the EFA (see Table 2). This suggests that, although there is some alignment between the consensus SME categories, based on their item sorting (Study 2), and the factor analysis of participant responses to these same items (Study 3), there is still misalignment between what items are rated as relevant to resilience and how these items are being categorized. That is, many of the most “relevant” items are not being sorted into any of the aligned factors. This observation highlights the value of assessing whether these factors truly reflect resilience, as a unique and distinct construct, or rather some other related phenomena.

We then used the scales based on the highest loading items in the factors (.364 and above, relatively low cross-loadings) to examine the convergent and discriminant validity of these scales with the established measures (i.e., Big Five personality traits, self-efficacy, optimism, social support, emotion regulation, and adaptability; Table 7). Observed patterns of convergent and discriminant validity could potentially be distorted by differential reliability. That is, some correlations might appear lower than others, not because the construct-level relationship is actually lower, but because the measures involved have lower reliability. Therefore, in an attempt to correct for this latter effect to get at the former, we corrected all observed correlations for measurement error variance, using the alpha reliability estimates available and classic disattenuation formula by Spearman (1987) that is often used in meta-analyses for similar corrections (Schmidt & Hunter, 2015). We found that the adaptability/self-efficacy resilience scale correlated more strongly with the established measure for self-efficacy (corrected $r > .90$) than with the other measures (corrected $r < .77$, with most $r < .60$).

Table 7. Correlations among exploratory factors and established measures.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Factors from EFA														
1. Factor 1: Adaptability/Self-efficacy	(0.95)	0.76	0.75	0.52	0.90	0.67	0.43	0.57	0.73	0.35	0.40	0.48	0.39	-0.56
2. Factor 2: Emotion Regulation	0.68	(0.84)	0.70	0.38	0.72	0.71	0.26	0.73	0.79	0.15	0.45	0.46	0.15	-1.00
3. Factor 3: Optimism	0.67	0.59	(0.84)	0.47	0.69	0.98	0.43	0.61	0.56	0.14	0.49	0.39	0.35	-0.70
4. Factor 4: Social support	0.47	0.32	0.40	(0.85)	0.47	0.40	0.87	0.39	0.40	0.28	0.15	0.39	0.36	-0.27
Established Measures														
5. Self-Efficacy Measure	0.84	0.63	0.61	0.42	(0.92)	0.67	0.46	0.54	0.66	0.30	0.43	0.41	0.30	-0.53
6. Optimism Measure	0.61	0.60	0.83	0.34	0.60	(0.86)	0.42	0.64	0.60	0.20	0.49	0.43	0.34	-0.73
7. Social Support Measure	0.40	0.23	0.38	0.77	0.42	0.37	(0.92)	0.33	0.22	0.16	0.23	0.35	0.36	-0.20
8. Emotion Regulation Measure	0.53	0.64	0.53	0.34	0.49	0.57	0.30	(0.91)	0.55	0.28	0.52	0.30	0.34	-0.75
9. Adaptability Measure	0.68	0.65	0.46	0.33	0.57	0.50	0.19	0.47	(0.81)	0.46	0.13	0.46	0.29	-0.61
Big Five														
10. Openness	0.29	0.12	0.11	0.22	0.25	0.16	0.13	0.23	0.36	(0.74)	-0.16	0.13	0.38	-0.06
11. Conscientiousness	0.31	0.33	0.36	0.11	0.33	0.36	0.18	0.40	0.09	-0.11	(0.64)	0.15	0.13	-0.47
12. Extraversion	0.42	0.38	0.32	0.32	0.35	0.36	0.30	0.26	0.37	0.10	0.11	(0.80)	0.29	-0.29
13. Agreeableness	0.34	0.12	0.29	0.30	0.26	0.28	0.31	0.29	0.23	0.29	0.09	0.23	(0.80)	-0.20
14. Neuroticism	-0.44	-0.74	-0.51	-0.20	-0.41	-0.54	-0.15	-0.57	-0.44	-0.04	-0.30	-0.21	-0.14	(0.64)

Note. Scale reliabilities in parentheses along the diagonal. Bold = correlations expected to demonstrate potential convergent validity; italicized = correlations expected to demonstrate potential discriminant validity. Raw correlations are below the diagonal; corrected correlations are above the diagonal. For the raw correlations, values with a magnitude greater than .14 are at a significance level of $p < .05$, and values with a magnitude greater than .18 are at a significance level of $p < .01$.

The emotion regulation resilience scale correlated very strongly with the neuroticism subscale of the Big Five (in fact, the corrected $r = 1.0$); however, this scale's correlation with the established measure of emotion regulation was lower, and similar to its correlations with established measures for self-efficacy, optimism, and adaptability (corrected r s around .75). The optimism resilience scale was correlated more strongly with the established measure for optimism (corrected $r > .95$) than for the other measures (corrected r s $< .70$). Finally, the correlation for the social support resilience scale was stronger with the established measure for optimism (corrected $r > .85$) than for the other measures (corrected r s $< .50$). Overall, this suggests meaningful overlap between the items in existing resilience measures, as reflected in our EFA-based scales, with well-established measures of similar constructs, such as self-efficacy, neuroticism, optimism, and social support.

Discussion

The goal of this paper was to systematically and empirically examine the item-level content of resilience measures to provide insight into the state of resilience measurement in the organizational sciences. Most item-level analyses happen during the initial development stage of measures, and therefore, this current cross-measure analysis is a broad and useful complement because it spans different resilience measures and highlights potential patterns across these measures and their items. In order to take a deeper look at the items in these resilience measures, we used resilience SME relevance ratings (Study 1), resilience SME item sorting (Study 2), and factor analyses of item responses, as well as convergent and discriminant validity analyses of scales based on the observed factors (Study 3).

In Study 1, we had resilience experts rate the current resilience items on how well they assess the construct of resilience. These relevance ratings demonstrated disagreement among resilience SMEs about how well the different items reflect resilience (see Table 2). The average Hinkin Tracey correspondence index was .53 ($SD = .13$), and because this statistic represents perfect definitional correspondence when the value is 1, this lower average correspondence index highlights how experts in the field do not perceive many of the items from existing resilience measures as relevant to their conceptualization of resilience or strongly disagree on how relevant these items are. This empirically demonstrates the magnitude and form of this well-known issue: that there are theoretical disagreements on how resilience is defined (Britt et al., 2016; Hartmann et al., 2019; King et al., 2016), which has led to substantial discrepancies in operationalizing this construct.

In Study 2, we had another set of resilience SMEs sort the resilience items based on their perceived relatedness to better understand what content groups the items were capturing. A varimax-rotated principal components analysis of the item rater agreement matrix from the open sort revealed eight intra- and interpersonal components that were labeled self-efficacy, social support, emotional regulation, determination/purpose, adaptability, optimism, problem-solving, and behavioral persistence. We also used the Hinkin Tracey correspondence indices for the individual items from Study 1 to examine the average index for the different components. Most of the indices ranged from .55 to .66. Notably, the behavioral persistence component had a higher average index at .83. These results highlight how the behavioral persistence component and its items may be most relevant to resilience SMEs' current conceptualization of resilience, and how the other components may be related to but potentially distinct from resilience.

To further examine this component structure generated by the SMEs, in Study 3 we had working adults fill out the resilience items and conducted a confirmatory factor analysis. The CFA (using the categories from Study 2 sorting) evidenced poor fit to the data, and as such, we ran an exploratory factor analysis to determine how the items were grouping together based on participant responses, independent of the SME sorting. Four factors emerged from the EFA, representing adaptability/self-efficacy, emotion regulation, optimism, and social support. These factors appear to line up reasonably well with the categories formed from the SME item sorting in Study 2, although the adaptability/self-efficacy factor contained items from a few different components from the item sorting

(i.e., adaptability, problem-solving, self-efficacy, determination/purpose, behavioral persistence). Finally, we examined the convergent and discriminant validity of the four EFA-derived scales with established measures of related constructs (i.e., adaptability, self-efficacy, emotion regulation, optimism, and social support), along with a measure of the Big Five personality traits. Overall, the scales demonstrated expected patterns of correlations with these measures (e.g., higher correlations between the adaptability/self-efficacy scale and the established self-efficacy measure, the emotion regulation scale and the neuroticism subscale of the Big Five, the optimism scale and the established optimism measure, the social support scale and the established social support measure); however, there were some correlations that were lower than expected (e.g., the adaptability/self-efficacy scale and the established adaptability measure, the emotion regulation scale and the established emotion regulation measure).

There are three main takeaways from these studies. First, there is disagreement among resilience SMEs about how relevant the items of 14 publicly available measures are to the construct of resilience; however, most items are generally rated as not relevant to this construct. Second, there are multiple factors that resilience items seem to be capturing, both demonstrated by the SME item sort and the participant responses. It is also interesting to note that, when looking back at the 12 items judged to have content representing resilience most highly (i.e., the highest Hinkin Tracey correspondence indices in Study 1), these items were not concentrated in one substantive domain but rather were distributed across the behavioral persistence, self-efficacy, adaptability, emotion regulation, and optimism components in Study 2, and three of the items did not sort into any component from the item sorting. In Study 3, half of these 12 items with high correspondence indices did not load onto factors in the EFA (Table 2). This suggests that, although there is some expert agreement on which items are the most highly relevant to the construct of resilience (Study 1), and although there is some alignment between how resilience SMEs sort items from existing resilience measures (Study 2) and how these items organize themselves into factors based on participant responses (Study 3), there is still misalignment between the items' definitional correspondence and the factors commonly found in existing resilience measures (i.e., many of the most "relevant" items are not loading highly onto a factor in our analysis).

Lastly, there is some convergence between the EFA-based scales that emerged from the resilience item responses and existing measures of related constructs (e.g., self-efficacy, neuroticism, optimism, social support), suggesting that there is more overlap in current resilience operationalizations with these related constructs than resilience researchers are intending and/or may be aware of. Overall, these findings highlight the pressing need to clarify our theoretical definition of resilience: Are constructs such as self-efficacy, neuroticism, optimism, and social support part of our core conceptualization of what resilience is, or are they related but distinct from resilience? In this paper, our goal is to offer a conceptual and empirical examination of the content and relevance of items contained in commonly used, publicly available resilience measures. This knowledge is to help demonstrate the current state of resilience measurement, and to spur further discussion and development for this critical domain.

As a potential way forward in the theoretical development and measurement of resilience, we have included the Hinkin Tracey correspondence indices from Study 1 throughout the studies to highlight the SME-rated relevance of the categories formed. Because the items with the highest Hinkin Tracey correspondence indices did not sort primarily into a single component or factor in Study 2 or Study 3, we cannot suggest any one component or factor on which a new resilience scale should be based. However, the behavioral persistence component did have a higher average Hinkin Tracey correspondence index than the other components in Study 2 (see Table 5). As a result, these items – both the ones with the highest correspondence indices and those captured in the behavioral persistence component – may provide some useful insight and guidance when developing an updated theoretical definition, and consequently an updated measure, of

resilience.³ At the very least, we hope to encourage resilience researchers to pay close attention to the items in the measures that they are using and make sure that the items are capturing resilience in the way that they are conceptualizing the construct. In addition, we would caution researchers from making definitive conclusions from meta-analytic studies on resilience based on existing measures, as our current study highlights how different measures of resilience may not be defining or operationalizing the construct in the same way.

Limitations and future directions

Although these item-level analyses provide interesting insights into the measurement of resilience, they are not without potential limitations. First, as previously mentioned, we did not include all of the possible resilience measures, and our results may be somewhat sensitive to the measures chosen. For example, we did not include the Global Assessment Tool (Peterson et al., 2011), Workplace Resilience Instrument (Mallak & Yildiz, 2016), or the Workplace Resilience Inventory (McLarnon & Rothstein, 2013), because these measures are not publicly available; however, it may be useful to include these measures in future research and discussions because they might help provide a more comprehensive view. In addition, because we focused this paper on resilience as a trait or capacity, we did not include the important perspective that resilience is a measured process or pattern of response (Becker & Ferry, 2016; Bonanno, 2005; Harms et al., 2018; Luthar et al., 2000), which again may have limited our takeaways for the resilience literature more broadly. As a result, we encourage future researchers to include these other conceptualizations of resilience when thinking about how they want to define and operationalize resilience in their work.

In addition, the methodology of our different studies merit further consideration. For example, in Study 1, we allowed the SMEs to provide their own definitions of resilience, which may have introduced some inconsistencies as to how they were conducting the relevance ratings. Although we believe that this descriptive approach best represents predominant perspectives in the resilience domain and the goals of this study – to examine the current state of resilience measurement in our field and see how people may be defining and conceptualizing resilience – we also acknowledge the limitations of this approach and how the results may have turned out differently if we instead provided a uniform definition in a prescriptive manner. In Study 2, the SMEs were only allowed to sort the items into one category, even though some of the items may have reasonably fallen into more than one group. We provided this restriction in order to create structure and organization in the sorting task. That being said, future researchers can replicate similar item sorting procedures and allow other variations, such as allowing participants to sort items into multiple categories (or assign weights across them) to see how many items are perceived to span more than one category. This may provide further insight on what content resilience items are perceived as capturing.

It is also important to acknowledge that our approach is not the only way to assess content validity of measure items. For example, Colquitt et al. (2019) discuss two similar but interesting alternatives for examining the content validity and distinctiveness of items within measures, where researchers can provide a definition of the construct of interest, as well as definitions of other related or unrelated constructs, and then have people either sort the items into the construct it best fits or rate each item on how well it fits each provided construct (Colquitt et al., 2019). These methods would be interesting to explore in future research and see how they relate to the results provided in this paper.

³As one reviewer pointed out, it is also interesting to note that many of the behavioral persistence items seemed to capture efficacy perceptions of resilience, whereas the other items captured antecedents or resources that psychologically drive resilience. Therefore, the behavioral persistence items may be falling into a different construct space than the other categories' items, and, moving forward, this is an important distinction to pay attention to in future scientific conversations and potential measure refinement.

Conclusion

Previous resilience theory and measurement development have offered useful and insightful information for scholars, practitioners, and organizations. This paper extends that work by providing useful insights on the critical concern that there are disparate conceptualizations of resilience across the organizational sciences, and many different measures of resilience have been developed based on these perspectives. The current work takes the novel, empirical approach of item-level analysis of a large set of resilience measures, revealing relevance of items to the construct, factors that are currently being assessed within resilience measures, as well as convergent and discriminant evidence involving measures of constructs related to the factors observed. In light of the diverse set of items in current measures of resilience, these findings strongly recommend that organizational science scholars more clearly delineate theoretically grounded definitions and models of resilience, and work to better align operationalizations and measurement with those theoretical underpinnings. This paper highlights both how far we have come and how far we still have to go in our critical efforts to improve and refine the resilience domain, an area that shows great promise for research and practice.

Declaration of interest

There are no conflicts of interest associated with the research, authorship or production of this article.

Funding

This work was supported by the National Science Foundation [1450681].

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Appendices

Appendix A:

Item List

Employee Resilience in Organizations (AMIR & STANDEN, 2012)

- I actively look for ways to overcome the challenges I encounter
- I look for creative ways to alter difficult situation (X24)
- I tend to bounce back after illness or hardship (X6+)
- I can grow in positive ways by dealing with difficult situation (X3+)
- I see difficult as challenges and opportunities to learn (X3)
- I am able to adapt to change (X1+)
- I often seek feedback on my work from others (X23+)
- I am not easily discouraged by failure (X32+)
- I am usually confident in doing whatever I choose
- I am enthusiastic in facing problems rather than avoiding them
- I am usually optimistic and hopeful
- I am interested in facing and solving problems
- I can see the humorous side of a problem (X27)
- I can get through difficult times at work because I've experienced difficulty before (X5)
- I think about my mistakes and learn from them (X4+)
- I think how I could have prevented unforeseen problems when they occur
- I don't give up when things look helpless (X31+)
- I tend to recover quickly from stressful events (X7+)

Baruth Protective Factors Inventory (Baruth & Carroll, 2002)

- There have been more problems than positive experiences with my health status in the last 3 months
- There have been more problems than positive experiences with my finances in the past 3 months
- There have been more problems than positive experiences with my family/friends in the past 3 months
- There have been more problems than positive experiences with my work/school in the past 3 months
- I feel that I am optimistic and concentrate on the positives in most situations (X29)
- I feel that I am a creative, resourceful, and independent person
- Most people think I'm friendly and like to be around me
- I feel that I am competent and have high self esteem
- I have a good relationship with at least one supportive person(whether in your family or not) (X22)

I have at least one good relationship in my life(whether in your family or not) (X22)
 I feel that I can trust at least one person in my life (whether in you family or not) (X22)
 I have at least one person who is interested in my life (whether in your family or not)
 I have been able to resolve many(but not all) of my problems by myself
 I feel I have control over many (but not all) events in my life
 I feel that I have coped well with one or more major stressors in my life
 I have been able to make “the best out of a bad situation” a number of times in my life (X29)

Ego-Resiliency Scale (Block & Kremen, 1996)

I am generous with my friends
 I quickly get over and recover from being startled
 I enjoy dealing with new and unusual situations (X26)
 I usually succeed in making a favorable impression on people
 I enjoy trying new foods I have never tasted before (X26)
 I am regarded as a very energetic person
 I like to take different paths to familiar places
 I am more curious than most people
 Most of the people I meet are likeable
 I usually think carefully about something before acting
 I like to do new and different things (X26+)
 My daily life is full of things that keep me interested
 I would be willing to describe myself as a pretty “strong” personality
 I get over my anger at someone reasonably quickly

Connor-Davidson Resilience Scale (Connor & Davidson, 2003)

Able to adapt to change (X1)
 Close and secure relationships (X22+)
 Sometimes fate or God can help
 Can deal with whatever comes
 Past success gives confidence for new challenge
 See the humorous side of things (X27+)
 Coping with stress strengthens
 Tend to bounce back after illness or hardship (X6)
 Things happen for a reason
 Best effort no matter what
 You can achieve your goals
 When things look hopeless, I don't give up (X31)
 Know where to turn for help (X21)
 Under pressure, focus and think clearly (X34)
 Prefer to take the lead in problem solving
 Not easily discouraged by failure (X32)
 Think of self as strong person
 Make unpopular or difficult decisions
 Can handle unpleasant feelings (X35)
 Have to act on a hunch
 Strong sense of purpose
 In control of your life
 I like challenges
 You work to attain your goals
 Pride in your achievements (X37+)

Five-by-Five Resilience Scale (Desimone et al., 2017)

Can switch gears easily
 Am open to change
 Don't like the idea of change
 Adapt easily to new situations
 Dislike the unknown
 Experience my emotions intensely
 Am not easily affected by my emotions
 Keep my emotions under control (X33)
 Am very sensitive and easily hurt

Get overwhelmed by emotions
 See difficulties everywhere
 Expect things to fail
 Look at the bright side of life (X29+)
 I fear for the worst
 Have a dark outlook on the future
 Am good at analyzing problems (X14)
 Can handle complex problems (X14+)
 Am less capable than most people
 Excel in what I do
 Can tackle anything
 Make friends easily (X19+)
 Feel empty in my relationships
 Tend to find social situations confusing (X20)
 Feel comfortable around people (X18+)
 Feel isolated from other people

Resilience Scale for Adults (Friborg et al., 2003)

I believe in my own abilities
 Believing in myself helps me to overcome difficult times (X16+)
 I know that I succeed if I carry on
 I know how to reach my goals
 No matter what happens I always find a solution (X13+)
 I am comfortable together with other persons (X18)
 My future feels promising
 I know that I can solve my personal problems
 I am pleased with myself
 I have realistic plans for the future
 I completely trust my judgments and decisions
 At hard times I know that better times will come
 I am good at getting in touch with new people
 I easily establish new friendships (X19)
 It is easy for me to think of good conversational topics (X17)
 I easily adjust to new social milieus (X20+)
 It is easy for me to make other people laugh
 I enjoy being with other people
 I know how to start a conversation (X17+)
 I easily laugh (X28)
 It is important for me to be flexible in social circumstances
 I experience good relations with both women and men
 There are strong bonds in my family
 I enjoy being with my family
 In our family we are loyal toward each other
 In my family we enjoy finding common activities
 Even at difficult times my family keeps a positive outlook on the future
 In my family we have a common understanding of what's important in life
 There are few conflicts in my family
 I have some close friends/family members who really care about me (X22)
 I have some friends/family members who back me up
 I always have someone who can help me when needed (X21+)
 I have some close friends/family members who are good at encouraging me
 I am quickly notified if some family members get into a crisis
 I can discuss personal matters with friends/family members
 I have some close friends/family members who value my abilities
 I regularly keep in touch with my family
 There are strong bonds between my friends
 Rules and regular routines make my daily life easier
 I keep up my daily routines even at difficult times
 I prefer to plan my actions
 I work best when I reach for a goal

I am good at organizing my time

Resilience Competency Scale (Griffith & West, 2013)

See things from other people's points of view
 Share frustrations and successes with friends
 Consider the needs of others
 Have strong relationships with peers, supervisors, and family (X22)
 Peers come to me for help and advice
 Think positive about myself when challenged
 Cope with periodic bad moods (X35)
 Not let negative events get to me
 Face new situations with an open mind (X26)
 Look for the "silver lining" when confronted with stressful situations
 Think clearly and calmly in difficult, stressful situations (X34+)
 Confident in handling stressful circumstances
 See change as an opportunity (X2+)
 Know my thoughts that cause me anxiety
 Know my weaknesses and areas to improve (X36)
 Control my emotions (X33)
 Use techniques to relax during stressful circumstances (X15+)
 Identify my strengths and weaknesses (X36+)
 Identify strengths and weaknesses in others
 Know my strengths to offer others (X36)

Resilience Appraisal Scale (Johnson et al., 2010)

If I were to have problems, I have people I could turn to (X21)
 My family or friends are very supportive of me
 In difficult situations, I can manage my emotions (X35)
 I can put up with my negative emotions (X35)
 When faced with a problem, I can usually find a solution (X12)
 If I were in trouble, I know of others who would be able to help me (X21)
 I can generally solve problems that occur (X12+)
 I can control my emotions (X33+)
 I can usually find a way of overcoming problems (X12)
 I could find family or friends who listen to me if I needed them to
 If faced with a set-back, I could probably find a way round the problem (X13)
 I can handle my emotions (X35+)

PsyCap's Resiliency Dimension (Luthans et al., 2007)

When I have a setback at work, I have trouble recovering from it, moving on (X8)
 I usually manage difficulties one way or another at work (X11)
 I can be "on my own," so to speak, at work if I have to (X30)
 I usually take stressful things at work in stride (X9)
 I can get through difficult times at work because I've experienced difficulty before (X5)
 I feel I can handle many things at a time at this job (X10)

Employee Resilience Scale (Naswall et al., 2015)

I effectively collaborate with others to handle unexpected challenges at work
 I successfully manage a high workload for long periods of time
 I resolve crises competently at work
 I learn from mistakes at work and improve the way I do my job (X4)
 I reevaluate my performance and continually improve the way I do my work
 I effectively respond to feedback at work, even criticism
 I seek assistance to work when I need specific resources
 I approach managers when I need their support
 I use change at work as an opportunity for growth (X2)

Brief Resilience Coping Scale (Sinclair & Wallston, 2004)

I actively look for ways to replace the losses I encounter in life
 I believe that I can grow in positive ways by dealing with difficult situations (X3)
 I look for creative ways to alter difficult situations (X24+)

Regardless of what happens to me, I believe I can control my reaction to it

Brief Resilience Scale (Smith et al., 2008)

I tend to bounce back quickly after hard times (X6)
 I have a hard time making it through stressful events (X8)
 It does not take me long to recover from a stressful event (X7)
 It is hard for me to snap back when something bad happens (X6)
 I usually come through difficult times with little trouble (X8+)
 I tend to take a long time to get over set-backs in my life (X7)

Resilience Scale (Wagnild & Young, 1993)

When I make plans, I follow through with them
 I usually manage one way or another (X11+)
 I am able to depend on myself more than anyone else
 Keeping interested in things is important to me (X25)
 I can be on my own if I have to (X30+)
 I feel proud that I have accomplished things in my life (X37)
 I usually take things in stride (X9+)
 I am friends with myself
 I feel that I can handle many things at a time (X10+)
 I am determined
 I seldom wonder what the point of it all is
 I take things one day at a time
 I can get through difficult times because I've experienced difficulty before (X5+)
 I have self-discipline
 I keep interested in things (X25+)
 I can usually find something to laugh about (X28+)
 My belief in myself gets me through hard times (X16)
 In an emergency, I'm someone people generally can rely on
 I can usually look at a situation in a number of ways
 Sometimes I make myself do things whether I want to or not
 My life has meaning
 I do not dwell on things that I can't do anything about
 When I'm in a difficult situation, I can usually find my way out of it (X13)
 I have enough energy to do what I have to do
 It's okay if there are people who don't like me

Resilience at Work Scale (Winwood et al., 2013)

I have important core values that I hold fast to in my work life
 I am able to change my mood at work when I need to
 I know my personal strengths and I use them regularly in my work
 The work that I do helps to fulfill my sense of purpose in life
 My workplace is somewhere where I feel that I belong
 The work that I do fits well with my personal values and beliefs
 Generally I appreciate what I have in my work environment
 When things go wrong at work, it usually tends to overshadow the other parts of my life
 Nothing at work ever really "fazes me" for long
 Negative people at work tend to pull me down
 I make sure I take breaks to maintain my strength and energy when I am working hard
 I have developed some reliable ways to relax when I am under pressure at work (X15)
 I have developed some reliable ways to deal with the personal stress of challenging events at work
 I am careful to ensure that my work does not dominate my personal life
 I often ask for feedback so that I can improve my work performance (X23)
 I believe in giving help to my work colleagues, as well as asking for it
 I am very willing to acknowledge others' effort and successes in my workplace
 I have a good level of physical fitness
 I am careful about eating well and healthily

I have friends at work whom I can rely on to support me when I need it
I have a strong and reliable network of supportive colleagues at work (X22)

Note. The (X#) represents items that were perceived as redundant with other items in the item pool; the number (e.g., X4) highlights the other items that an item was perceived as redundant with, and the + marks the item that was retained.R.

SME Appendix B:

Definitions of Resilience

Relevance Ratings Participants

- “The tendency to demonstrate positive adaption in the face of a significant adverse event (as in, the tendency to demonstrate resilience as an outcome)”
- “An individual difference trait that allows individuals to persevere through difficult tasks, bounce back when faced with adversity, and appraise events as challenges rather than hindrances.”
- “Resilience comprises a heterogeneous set of individual differences that allow a person to endure stressful situations without experiencing psychological or physical illness.”
- “The dispositional tendency to be able to bounce back or recover from stressors as measured by the Brief Resilience Survey.”
- “Stable individual characteristics that enable a person to be resistant (e.g., unaffected), rebound (e.g., post traumatic growth), or recover (e.g., return to normal functioning after a period of strain) from stressors. Note - the three Rs are outcomes to trait resilience.”
- “Trait resilience, referred to as resiliency, characterizes individuals by the degree to which they can withstand, bounce back from or experience post-traumatic growth after experiencing an adverse experience. This adversity can take many forms and levels of severity such as enduring chronic trauma or one-time events. In certain contexts, resiliency may be captured through one’s ability to persevere through trauma in regards to continued work performance or success in other areas of life but this may inadvertently capture the construct of grit or conscientiousness.”