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A Critical Review of Scales Used in Resilience Research

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Abstract: *This paper reviewed some of the most commonly used measures of resilience. Among these measures, four of them were found to be used more frequently than others and therefore discussed. These are Connor-Davidson Resilience Scale (CD-RISC), Connor-Davidson Resilience Scale 10 (CD-RISC 10), Resilience Scale for Adults (RSA), Brief Resilience Scale (BRS). The scales were presented in tables. After critical examination, CD-RISC and CD-RISC 10 scales were found to be the most dominant scales in assessing resilience as they possess best psychometric properties.*

I. Introduction

In today's dynamic environment, the capability of an individual, organizations and community to be resilient is very vital. Individual, communities, entrepreneurial organizations as well as countries at large are all vulnerable to environmental uncertainties and changes which present so many repercussions such as diseases, disasters, terrorism, economic shocks, human error as well as equipment failure etc. (Bhamra, Dani, & Burnard, 2011). In this regard, "resilience has a bright future ahead of it as an explanatory concept in various allied fields that deal with environmental extremes" (Alexander, 2013, p. 2714).

The concept of resilience has attracted serious attention of researchers, practitioners and policy makers for over five decades ago (Duarte Alonso, 2015; Duarte Alonso& Bressan, 2015; Bonanno et al., 2015; Distelberg, Martin, Borieux, & Oloo, 2015; McGreavy, 2015; Rivera, & Kapucu, 2015; Abramson et al., 2014; Béné, Newsham, Davies, Ulrichs, & Godfrey-Wood, 2014) and it has becomes conspicuous in virtually all human endeavours and in different academic disciplines (Ledesma, 2014; Bhamra et al., 2011; Djalante, Holley, & Thomalla, 2011) such as individual and organisational psychology (Powley, 2009), supply chain management (Hohenstein, Feisel, Hartmann, & Giunipero, 2015; Tukamuhabwa, Stevenson, Busby, & Zorzini, 2015), strategic management (Ortiz-de-Mandojana& Bansal, 2015), safety engineering (Hollnagel, 2015; Harrington& Laussen, 2015) and ecology (Childers et al., 2015), especially after the prominent work of Gunderson and Holling (2001) who popularized the concept among scholars and practitioners (Limnios et al., 2014). Further, the frequency of usage of the term especially how it featured in the journals and articles' titles in the social science researches most especially from 2010, has unequivocally shown the dominant role it plays in various aspects of human life (Bonanno et al., 2015). More so, a lot of money is being spent on resilience projects around the world (McGreavy, 2015).

II. Resilience

According to Dahlberg, Johannessen-Henry, Raju, and Tulsiani, (2015), the concept of resilience has different designation from different disciplines and scholars. In social sciences, economists label it as coping capacity and anthropologists termed it bounce back better (e.g. Alexander, 2013). In business is referred to as "business continuity plan" and in psychology, it refers to capability to mitigate shock (Shimada, 2014) ecologist termed it adaptation (e.g. Holling 1973) and engineering considered to be a capability of a structure to absorb shock while at the same time retaining its functions (Walker & Cooper, 2011). It is a concept that symbolizes strength, capability, elasticity as well as evolution and has been used for centuries (Alexander, 2013). More so, the concept has been featuring as a keyword in different conceptual as well as theoretical articles and titles in academic journals especially in the field of disaster studies, taught in higher institutions of learning and are entrenched in different policies around the globe (Dahlberg et al., 2015). It "cuts across disciplines and within a discipline". (p. 51) and "cuts across development, humanitarian and environmental processes" (Mitchell, 2012, p.9). In fact, Zolli and Healey (2012) argued that the concept has virtually affect every part of human existence, hence is "a powerful lens through which we can view major issues" (p. 16).

Table 1

Definitions of Resilience

Authors/Year	Definitions
Cheshire, Esparcia, & Shucksmith, 2015	Individuals' ability to adapt to, and recover from disturbing events
Hobfoll, Stevens, & Zalta, 2015	The ability of individuals or human systems to absorb stressors and return to their original state when that stressor is lifted without creating permanent damage or harm.
Everly Jr, Strouse, & McCormack, 2015	The ability to see yourself in the dark abyss of failure, humiliation or depression – and bounce back not only to where you were before but to even greater height of success, happiness, and inner strength.
Ledesma, 2014	The ability to bounce back from adversity, frustration, and misfortune.
Limnios, Mazzarol, Ghadouani, & Schilizzi, 2014	The magnitude of disturbance the system can tolerate and still persist.
Boin, Comfort & Demchak, 2010	The capacity of a social system (e.g. an organization, city, or society) to proactively adapt to and recover from disturbances that are perceived within the system to fall outside the range of normal and expected disturbances.
Connor & Davidson, 2003	Personal qualities that enable one to thrive in the face of adversity.

Resilience is a "Polysemous" construct (Strunz, 2012, p.113) having various definitions (see table 1) that share some similarities "the capacity of the individual to overcome adversity" and "ability to bounce back" (Chadwick, 2014). As contentious as the definitions of resilience, generally, there has been agreement among scholars that the resilience differs among places, context and the nature of the threats/events. As such, it is very hard (if not impossible) to establish a generic scale that will suit all places, all context and all events. This difficulty can be seen by the overflow of different conceptualization and operationalization as well as proposed measures of resilience in the literature. This paper presents several scales used to measure resilience, including the author name, dimensions (factors), number of items and scales used (see table 1). According to Windle, Bennett, and Noyes, (2011) who reviewed 19 validated scales of resilience found that the psychometric properties of these scales vary, some are better than the others. Likewise, all have some challenges regarding their psychometric properties. But they argued that Resilience Scale for Adults, Brief Resilience Scale and the Connor-Davidson Resilience Scale (CD-RISC) have the finest psychometric ratings. Therefore, these will be discussed.

Table 2

Resilience Instruments

Instrument	Authors	Dimensions	Number of	Scaling
RSCA	Prince-Embury, 2006, 2008 & 2009	Emotional reactivity 1. Sense of mastery Sense of relatedness Sense of Mastery Scale	64	5-point Likert scale
RS	Wagnild & Young, 1993	Personal competence Acceptance of self and life	25	7-point Likert scale
RS-11	von Eisenhart Rothe et al., 2013	Unidimensional	11	7-point Likert scale
RS-14	Damásio, Borsa, & da Silva, 2011	Self-reliance Meaningfulness Equanimity Perseverance existential aloneness	14	7-point Likert scale
BPFI	Baruth & Carroll, 2002	Adaptable personality Supportive environment Fewer stressors Compensating experiences	16	5-point Likert scale
RSA	Friborg et al., 2003; Friborg et al., 2009	Positive perception of self Positive perception of future Social competence Structured style Family cohesion Social resources	33	Semantic differential response format
CD-RISC	Connor & Davidson, 2003	Personal competence, high standards, and tenacity	25	5-point Likert scale

		Trust in one's instinct, tolerance of negative effects, and strengthening effects of stresss		
		Positive acceptance of change and secure relationships		
		Control		
		Spiritual influences		
CD-RISC-10	Cambell-Sills & Stein, 2007	Unidimensional	10	5-point Likert scale
CD-RISC-2	Vaishnavi, Connor, & Davidson, 2007	Unidimensional	2	5-point Likert scale
RSAS	Jew, Green, & Kroger, 1999	Active skill acquisition	35	5-point Likert scale
		Future orientation		
		Independence/risk taking		
MIIRM	Martin, Distelberg, Palmer, & Jeste, 2015	Self-efficacy, Access to social support network Optimism Perceived economic and social resources,	22	5 and 4-point Likert scale
RAS	Corrigan, Salzer, Ralph, Songster, & Keck, 2004	Personal confidence and hope Willingness to ask for help Goal and success orientation Reliance on others No domination by symptoms	24	5 and4-point Likert scale
PR	Windle, Markland, & Woods, 2008	Self-esteem, Personal competence Control	19	
CYRM	Ungar etal., 2008	Individual Relational Community Culture	28	5-point Likert scale
ARQ	Gartland, Bond, Olsson, Buzwell, & Sawyer, 2011	Individual Family Peers School Community	93	5-point Likert scale
BRS	Smith et al., 2008	Unidimensional	6	5-point Likert scale
ARS	Oshio et al., 2003)	Novelty seeking Emotional regulation	21	5-point rating scale
		Positive future orientation		
READ	Hjemdal et al., 2007)	Personal competence Social competence	28	5-point Likert scale
		Structured style Family cohesion		
TRS	Madsen, & Abell, 2010	Problem Solving Relationship Optimism Spirituality	59	7-point Likert scale
BRCS	Sinclair & Wallston, 2004	Adaptive coping (Polk's situational patterns)	4	5-point rating scale
RIM	Ryan & Caltabiano, 2009	Self-efficacy	25	5-point Likert scale
		Family/social networks		
		Perseverance		
		Internal locus of control Coping and adaptation		

MMPR	Wei & Taormina 2014	Determination Endurance Adaptability Recuperability	40	5-point Likert scale
ER	Klohnen (1996)	Confident optimism Productive and autonomous activity Interpersonal warmth and insight Skilled expressiveness		
ERS	Bromley, Johnson & Cohen, 2006	Confident optimism Productive activity Insight and warmth Skilled expressiveness	102	dichotomous dummy variables (0 and 1)
ER89	Block & Kremen, 1996	Unidimensional	14	4-point scale
ER89-R	Alessandri, Vecchione, Caprara & Letzring, 2012 Vecchione et al., 2010	Openness to Life experiences Optimal Regulation	10	7-point Likert scale

Key

MIIRM- Multidimensional Individual and Interpersonal Resilience Measure
CDRISC - Connor–Davidson Resilience Scale
RSA - Resilience Scale for Adults
BRS - Brief Resilience Scale
PR - Psychological Resilience
RAS - Recovery Assessment Scale
RSAS - Resilience Skills and Abilities Scale
ARQ - Adolescent Resilience Questionnaire
ARS - Adolescent Resilience Scale
READ - Resilience Scale for Adolescents
RSCA RSCA - Resiliency Scales for Children and Adolescents
RS - Resiliency Scales
BPFI - Baruth Protective Factor's Inventory
BRCS - Brief Resilient Coping Scale
RIM - Resilience in Midlife Scale
CYRM - Child and Youth Resilience Measure
TRS - Trauma Resilience Scale
MMPR MMPR- Multidimensional Measure of Personal Resilience
ERS - Ego Resiliency Scale
ER89-R - Ego Resiliency Scale Revise

Resilience Scale for Adults (RSA)

RSA is a self-reported scale developed by (Friborg, Hjemdal, Rosenvinge, & Martinussen, 2003) to measure individuals' protective resilience elements (Smith-Osborne, & Whitehill Bolton, 2013). So many scholars used it and applaud its psychometrics - validity and reliability (Hjemdal et al., 2011; Friborg, Hjemdal, Martinussen, & Rosenvinge, 2009, 2006). Initially, the scale was five factor comprised of 45 items of five dimensions: personal competence, social competence, family coherence, social support and personal structure. Cronbach's alpha, 0.90, 0.83, 0.87, 0.83 and 0.67 respectively.

Compared to the existing resilience scales, the RSA covers all three of the main classes of resilience; dispositional attributes, family cohesion/warmth and external support systems. The first consists of three aspects 'personal competence', 'social competence' and 'personal structure'. 'Personal competence' assessed the level of self-esteem, self-efficacy, self-liking, hope, determination and a realistic orientation to life. 'Social competence' assessed the extraversion, social adeptness, cheerful mood, an ability to initiate activities, good communication skills and flexibility in social matters. 'Personal structure' assessed the ability to uphold daily routines, to plan and organize. The second class was comprised by the dimension 'family coherence' that assessed the amount of family conflict, cooperation, support, loyalty and stability. The third and last class 'external support systems' was consisted of the 'social support' that assessed the access to external support from friends and relatives, intimacy, and the individual's ability to provide support (Friborg et al 2003).

Later, study conducted to verify the factor structure of the scale, the CFA shows better fit as six factor model by splitting the personal strength into planned future and perception of self (Basim, & Cetin, 2011; Jowkar, Friborg, & Hjemdal, 2010). These six factors consist of perception of self (α = .74), planned future (α = .73), social competence (α = .83), structured style (α = .80), family cohesion (α = .80), and social resources (α = .74) (Friborg et al., 2005; Hjemdal et al., 2006) of thirty three (33) indicators on 5-rating scale. It was initially validated in Scandinavia on 183 adults population aged 18-75 (Friborg et al., 2003). After the original validation,the authors frequently revalidate and modify it (Friborg et al., 2009; Friborg et al., 2005).

In summary, the scale operationalizes the concept of resilience in both contextual and psychological term (Smith-Osborne & Whitehill Bolton, 2013; Basim & Cetin, 2011; Jowkar et al., 2010) and the five-dimensional scale corresponds well with the overall categorization of resilience, recapitulated as characterized by (i) personal/dispositional attributes, (ii) family support and (iii) external support systems. Therefore, the authors recommends that the RSA-scale might be used as a valid and reliable measurement of resilience.

Table 3

Resilience Scale for Adults (RSA)

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

Sources:Friborg, Hjemdal, Rosenvinge, & Martinussen, 2003

Connor-Davidson Resilience Scale (CD-RISC)

Due to inherent problems in most of the scales developed to measure resilience such as lack of wider acceptability and applicability, Connor and Davidson (2003) developed CD-RISC, a valid and reliable resilience measurement aimed at remedying the challenges of other measurements. It is a brief self-rated instrument that measure resilience, which consists of 25 items on 5-point Likert scale (Connor & Davidson, 2003). The measurement content was extracted from different number of sources, from Kobasa's seminal work (Kobasa, 1979), Rutter's work (Rutter, 1985), Lyons (1991) and experiences of Shackleton's heroic adventure in the Antarctic in 1912 (Alexander, 1998).

After the pioneer work of Connor and Davidson (2003), several studies examine the psychometric properties of CD-RISC, assessing its validity and reliability (Ni et al., 2016; Fernandez, Fehon, Treloar, Ng, & Sledge, 2015; Jeong et al., 2015;Asante & Meyer-Weitz, 2014; Ayala & Manzano, 2014; Fu, Leoutsakos, & Underwood, 2014; Liu, Fairweather-Schmidt, Burns, & Roberts, 2014; Coates, Phares, & Dedrick, 2013; Manzano & Ayala, 2013; Dolores et al., 2012; Goins, Gregg, & Fiske, 2012; Jung et al., 2012; Notario-Pacheco et al., 2011; Baek, Lee, Joo, Lee, & Choi, 2010; Burns & Anstey, 2010; Jowkar et al., 2010;Karaırmak, 2010; Singh & Yu, 2010; Wang, Shi, Zhang, & Zhang, 2010; Khoshouei, 2009; Campbell-Sills & Stein, 2007). These studies documented that the scale has a better psychometric properties compared to others and therefore, it "appears to be one of the more widely used resilience measures" (Goins et al., 2012, p.3)

Initially, CD-RISC was a five factor scale – personal competence, high standards, and tenacity (8 items); trust in one's instinct, tolerance of negative effects, and strengthening effects of stress (7 items); positive acceptance of change and secure relationships (5 items); control (3 items) and spiritual influences (2 items), (Connor & Davidson, 2003), but, after several refinements, validations and revalidations, studies found it fit on different factors such as the original five factor model, (Pangallo, Zibarras, Lewis, & Flaxman, 2015; Windle et al., 2011; Yu, Lau, Mak, Zhang & Lui, 2011; Jowkar, et al., 2010), four factor model (Wu, Tan, & Liu, 2017; Lamond et al., 2009), three factor model, (Ayala, & Manzano, 2014; Karaırmak, 2010; Yu & Zhang, 2007), two factor model and others one factor – undimensional model (Fernandez et al., 2015; Jeong et al., 2015; Coates et al., 2013; Gucciardi, Jackson, Coulter, & Mallett, 2011; Burns & Anstey, 2010; Wang, Shi, Zhang, & Zhang, 2010; Campbell-Sills, & Stein, 2007; Vaishnavi, Connor, & Davidson, 2007). Furthermore, for its crucial role in explaining the concept of resilience, the CD-RISC is one of the most widely validated scale in resilience literature, (Campbell-Sills & Stein, 2007), and it has been translated into many languages across wide range of populations (Gucciardi et al., 2011; Wang et al., 2011). The scale has been tested using sample of young adults (Burns & Anstey, 2010), earthquake survivors (Karairmak, 2010), teenagers (Jorgensen & Seedat, 2008), young women (Clauss-Ehlers, 2008), nurses (Gillespie, Chaboyer, & Wallis, 2007), graduate students (Singh & Yu, 2010) as well as general population (Yu & Zhang, 2007).

Table 4

Connor-Davidson Resilience Scale CD-RISC

S/N	Items
1	Able to adapt to change
2	Close and secure relationships
3	Sometimes fate or God can help
4	Can deal with whatever comes
5	Past success gives confidence for new challenge
6	See the humorous side of things
7	Coping with stress strengthens
8	Tend to bounce back after illness or hardship
9	Things happen for a reason
10	Best effort no matter what
11	You can achieve your goals
12	When things look hopeless, I don't give up
13	Know where to turn for help
14	Under pressure, focus and think clearly
15	Prefer to take the lead in problem solving
16	Not easily discouraged by failure
17	Think of self as strong person
18	Make unpopular or difficult decisions

19	Can handle unpleasant feelings
20	Have to act on a hunch
21	Strong sense of purpose
22	In control of your life
23	I like challenges
25	You work to attain your goals
25	Pride in your achievements

Source: Connor and Davison 2003

Connor-Davidson Resilience Scale (CD-RISC) 10

As a result of instability in the five factor structure of CD-RISC (Fu, Leoutsakos, & Underwood, 2014) discussed above, and inability of the researchers to agree on the best possible factor compositions of the scale (Notario-Pacheco et al., 2011), Campbell-Sills & Stein, (2007) extracted and validated CD-RISC 10, a unidimensional 10 items scale that have high loadings, show high level of consistency or loaded onto very strong factor from the original 25 item of Connor and Davidson (2003) and validated them using 1,743 sample of undergraduate students (Coates, Phares, & Dedrick, 2013). Subsequently, Burns and Anstey (2010) and Gucciardi, Jackson, Coulter, & Mallett, (2011) validated it using sample of Australian adult.Although, both have good psychometric properties, CD-RISC 10 possessed better and more established factor structure and is more robust, more efficient as well as simple and parsimonious (Ye et al., 2017; Dolores et al, 2012; Goins et al., 2012; Gucciardi et al., 2011; Notario-Pacheco et al., 2011; Burns & Anstey 2010; Campbell-Sills & Stein, 2007). It is also good for assessing resilience of low-income population (Coates et al., 2013).

Table 5

Connor-Davidson Resilience Scale 10

S/N	Items
1	I am able to adapt to change
2	I can deal with whatever comes
3	I tries to see humorous side of problems
4	Coping with stress can strengthen me
5	I tend to bounce back after illness or hardship
6	I can achieve goals despite obstacles
7	I can stay focused under pressure
8	I am not easily discouraged by failure
9	I think of self as strong person
10	I can handle unpleasant feelings

Source: Campbell-Sills & Stein, (2007)

Brief Resilience Scale (BRS)

Developed and validated by Smith et al., (2008), brief resilience scale is a self-reported aimed at assessing the most basic and the original sense of resilience, that is "the ability to bounce back from stress" (Smith, Tooley, Christopher, & Kay, 2010, p. 168). Its psychometric properties were evaluated in four different samples (Smith et al., 2008) with good Cronbach's alpha of 0.80 and above in all the samples studied (Smith, et al., 2010). It is unidimensional construct with 6 indicators rating on 5-point ranging from 1, strongly disagree to 5, strongly agree. In other words, the scale was reliable as unitary construct. It was predictably linked to social relations, coping, personal characteristics and health in all samples. It was negatively associated to depression, negative affect, anxiety and physical symptoms. The BRS is a reliable means of assessing resilience as the ability to bounce back or recover from stress and may provide unique and important information about people coping with stressors.

According to the authors, the BRS may have an exceptional place in behavioural research because previous measures of resilience do not target the resilience itself but the personal characteristics that may promote positive adaptation. Hence, the BRS is the only measure that specifically assesses resilience in its original and most basic meaning: to bounce back or recover from stress (Agnes, 2005). When studying people who are already ill, assessing the specific ability to recover may be more important than assessing the ability to resist illness.

Table 6

S/N	Brief Resilience Scale (BRS)
1	I tend to bounce back quickly after hard times
2	I have a hard time making it through stressful events (R)
3	It does not take me long to recover from a stressful event
4	It is hard for me to snap back when something bad happens (R)
5	I usually come through difficult times with little trouble
6	I tend to take a long time to get over set-backs in my life (R)

Note. R = reverse coded items.
Source: Smith et al., 2008

III. Conclusion

This paper review some of the scales frequently used to measure resilience. In all the measurements reviewed, based on their psychometric properties; their validity as well as reliability, the most widely used scale for measuring resilience is CD-RISC, most especially the 10-items scale (Campbell-Sills & Stein, 2007). This paper also discovered that majority of studies that used CD-RISC were conducted in medical and or disaster studies. It is therefore imperative to use this scale to assess the resilience of individuals in other fields such as entrepreneurship and general management.

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