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## **A Holistic Approach to Measuring Resilience: Development and Initial Validation of Resilience Test Battery**

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### **Abstract**

*Resilience refers to performance in the face of adversities. Two factors interwoven with the concept are 'adversities' and 'achievements' each of which leaves wide variations in interpretation. The process of resilience explains the way the protective factors operate as a buffer against the adversities impacting performance. The outcome in the form of resilience is performance in the face of adversities. Because of the inherent complexity of the construct, the measurement of resilience varied widely to suit the researchers' objectives and the sample chosen to study. It is time that attempts are initiated to measure resilience taking into consideration all the factors in operation in the process of resilience. Resilience Battery was constructed taking into account the adversity, buffering factors, and achievement in the face of adversities. Unlike the existing scales of resilience, this tool follows a multidimensional approach and a formula derived Resilience Index. Resilience Test Battery was constructed and validated using the standard procedure. The Resilience test battery was constructed along the lines Hariharan-Rana Synergy Model of resilience that included all the relevant components of resilience. Psychometric properties of the battery were tested and are found adequate.*

***Keywords: Resilience; resilience battery; resilience index; psychometric properties; synergy model.***

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Resilience is often described as a process evolving through a curious interaction between the self and the environment. Thus, internal and external factors aid and facilitate in the emergence of resilience. Researchers found that there has been a considerable shift from risk/vulnerability to resilience. A new approach called the Multilayered Social Resilience framework was developed. This framework helps in understanding the interaction between

enabling factors and capacities operating at varied levels of the society (Obrist, Pfeiffer, & Henley, 2010. Rutter (2012) while explaining resilience as a process of overcoming stress or adversity, positive outcome in the face of risk or reduced vulnerability despite adverse life experiences stated that the very concept of resilience as ‘interactive’. Ungar (2011) stated that encountering adversity depends not only on the individual but on the “supportive relationships, practical assistance and environmental resources they are able to access”. The complexity of resilience was eventually acknowledged by referring to capabilities, processes or outcome indicated by adaptation in the context of adversities (Masten, 2018).

Adversity, the buffering forces and the consequent positive performance are major identified components in resilience. Some studies chose to have a comprehensive measure of adversity by including the past adversities experienced (Beutal, Tibubos, Reiner, Kocalevent, and Brahler, 2017). Adversity can vary in its severity, duration and frequency. Individuals suffer adversities in multiple domains of life. Hence the measurement has to be comprehensive with all the factors included. Similarly, some internal characteristics of the individual (Protective Factors) as well as some factors of the external environment (Promotive Factors) can function as buffers against the adversities. (Hariharan and Rana, 2017). The advantage in having distinct identity for these buffers is their use in tailoring appropriate interventions for enhancing resilience. Thus, Hariharan-Rana Synergy model incorporates the complexity of the constructs of resilience.

Earlier researchers called the internal factors (personal characteristics like autonomy, resourcefulness) and the external factors (healthy relationships, good schooling or strong social support) as ‘Protective factors’. They were construed as acting as a buffer and preventing the risk factors harming the person (Rutter, 1987). Hariharan and Rana (2017) classified them as Protective and Promotive factors. The internal characteristics of the individual were called protective factors for they protect the individual against the negative impact of adversities. The external factors in the physical and social environment are called ‘Promotive factors’ for they help promoting the performance by providing necessary buffer.

Study of resilience should move from variable approach to processes, mechanisms to understand the dynamic inferential and interactional characteristics of the construct in association with, during and after the experience of adversity (Masten and Wright, 2010). Researchers working in the area of resilience have been increasingly feeling the need to capture the construct with its complexity. It is important to understand how multiple levels of influence operate synergistically (Deb, 2018).

The Resilience Test Battery is constructed to measure resilience as a complex construct that operates through a process.

**Objective:** The objective of this study is to develop and validate a Resilience Test Battery (REST Battery) as a comprehensive measurement of resilience in line with Hariharan-Rana Synergy model and validate it.

**Method:** The Method involves the steps in construction of the Resilience Test Battery (REST), evolving the scores through application of the formula and testing the psychometric properties of it.

**Construction of Resilience Test Battery (REST Battery):** The Resilience Test Battery consists of four scales, viz- Adversity scale, Protective Factors scale, Promotive Factors scale and Achievement scale. The process of developing each of these four scales in the battery is described in detail.

### **Procedure:**

**Phase I: Construction of the battery:** Construction of the scales of Adversity, Protective factors and Promotive factors followed the three-step method involving item pooling, item writing, and item reduction.

i) Item pooling—We reviewed literature related to resilience and existing scales of resilience and identified and noted the major components of adversities. Similarly, buffering factors like innate characteristics and positive environmental factors facilitating performance were also identified from literature and noted down. A series of six brainstorming workshops with the psychologists and students of Psychology pursuing Master's Degree. Participants were given an orientation on resilience. The adversities having wide range of variations across demography, wide range of positive characteristics in people that help them overcome difficulties and stress and a variety of positive aspects in the environment that shields them from impacts of life adversities were discussed along with the identified factors from literature. Participants were divided into small groups and requested to discuss and add to the list of adversities, protective factors and promotive factors (gathered from literature) facilitating performance in resilient persons. At the end of the workshops, items for the Adversity Scale counted up to 106. Items for the scales of Protective factors and Promotive factors totalled up to 32 and 21 respectively.

ii) Item writing- We took each of the three lists evolved in the workshops. Each item was written in the form of short and crisp statement following the standard procedure of item writing.

The produced statements were checked by subject experts for bias and insensitivity and were modified after further evaluation by the committee of subject experts complying with accepted procedural norms (La Duca, Downing, & Henzel, 1995).

iii) Item reduction—Attempt for item reduction was made following the criteria of Non-repetitiveness, Essentiality, Unambiguity and Relevance to Indian context (NEUR). All the items with content validity ratio of 0.44 and above were retained (Lawshe, 1979). Based on the above, 66 items were retained in Adversity Scale 28 items in Protective factors scale and 19 items in Promotive factors scale.

iii) Achievement Scale- A different approach was adopted for evolving Achievement scale because achievements have wide individual variations and have high subjectivity. Instead of writing down the items based on the literature and expert involvement, inputs were taken from a sample. A sample of 100 participants in the age group of 15– 34 years

were asked to narrate their success and achievements in life. This generated 348 responses that delineated expressed accomplishments. These items were then thematically classified under ten categories

### **Structure of Scales:**

i) **Adversity Scale**—The 66 items adversity scale comprised of statements of situations of adversities ranging from severe life situations like ‘facing a natural disaster’ to moderate aberrations like ‘frequent ill health’. They pertain to adversities incurred by self like ‘being jailed’ to adversities that are related to one’s close environment such as ‘one or more family member suffering from prolonged physical or mental illnesses’. The tool was designed to have five columns. The first column on extreme right was blank. The second column consisted of statements on adversities. The third to fifth columns were blank. The first column was for the respondents to tick those statements that they had experienced in their lives. The third column titles ‘Severity’ was for the respondents to record their ratings of the severity (Ex: Met with an automobile accident), fourth column titled ‘Duration’ was for rating the duration for which they suffered the adversity (Ex: Suffered poverty) and the fifth titled ‘Frequency’ required them to record the frequency with which they encountered the adversity (Ex: Discriminated due to one’s caste) Only those items in the scale for which the first column is ticked need responses for other columns. Duration and frequency columns have to be filled as per the relevance of the item (Ex: The item ‘Suffered poverty’ requires to fill the duration column but not the frequency column).

ii) **Protective factors scale**—The items in this scale consisted of statements related to 28 internal characteristics helpful to one in encountering the adversities. They ranged from simple characteristics like ‘having confidence in self’ to complex characteristics like ‘ability to mobilise resources to solve problems’. The column on the left of those items is left blank. The participants were asked to tick in the preceding column the characteristics present in them. On the right of the 28 items list is a blank column where participants are required give ratings (on a 10-point scale) on their perceived strength of each characteristic in encountering adversity. This rating was required only for the items ticked by the person indicating its presence in him/her.

iii) **Promotive factors scale**—This scale consisted of 19 statements related to the environmental resources that promoted a healthy encounter with adverse situation. They ranged from family support like ‘having a supportive husband/wife’ to formal support like ‘health care facilities within reach’. In line with other two scales, the participants were required to check the item present in one’s environment in the left side column and then rate the item on advantage of the situation/resources (in encountering adversities) to the person on a 10-point scale (1 being low advantage and 10 being high advantage).

At the end of every scale a blank space was left with a notification ‘any other’ so that the participants could add the items other than what is included in the list.

iv) Achievement scale— The Achievement Scale consisted of the list of ten thematic categories, viz achievements in fields like scholastic, artistic, athletic, career, promotion, scholarships, first generation doctorates, admission in apex institutes, awards received and medals awarded for any distinction. On the left side of the list was a blank column for the participant to tick indicating his/her achievement in the said category. On the right of the list was a column where the participant is required to rate the achievement on a 10point scale, rating the significance of the achievement to the individual(ranging from of low significance to high significance).

**Phase II: Pilot testing and finalization of Resilience Test Battery:** Sample: The sample consisted of 1333 participants drawn from the age group of 15 – 34 years (mean age = 23.55). This included both the genders (men = 53.41% & women = 46.58%), with a wide range of educational qualifications (higher secondary = 27%; undergraduates = 32%; post graduates and above = 35%; not disclosed = 6%) and all possible marital status (unmarried = 79%; married = 20.4%; divorced / separated= 0.30%; widow = 0.07%; not disclosed = 0.22%). The sample belonged to different occupations (student = 41.71%; home maker = 7.50%; business = 4.51%; self-employed = 3.03%; employed = 10.02%; not disclosed = 33.23%).

The sample was administered the Adversity scale Protective factors scale, Promotive factors scale and the Achievement scale.

Confirmatory factor analyses were carried out on each of the scales separately. In Protective factors scale of 28 items four items with Eigen value less than 0.39 were dropped. Only a single factor emerged. Thus, the final scale of Protective factors consisted of 24 items.

In Promotive factors scale five items with Eigen value of less than 0.39 were dropped. Five factors emerged. However, the factors were not named or considered as the purpose of the scale was to give a single composite score for the formula. Thus, the final scale of Promotive Factors consisted of 14 items No Factor Analysis was done to finalise the Adversity Scale. It was finalized on the criteria of expert decision to satisfy the essential characteristics stipulated by the theoretical postulate. Those items with a mean rating of 8 or above on severity scale were retained. The reason is that the very assumption of resilience as per Hariharan-Rana model (2017) is ‘excellence in the presence of high adversity’. Thus, items with ratings lower than those polarized towards high severity may indicate only minor aberration (ex. Fight with a friend) not warranting serious adversity. By following this method, a total of 49 items were retained in the final format of the scale.

Similar to the adversity scale the expert decision was applied in finalizing the items in order to satisfy the theoretical criteria of the model which is ‘excellence in the face of high adversity’. Hence, those achievements receiving a rating of 8 or more on the scale of significance to the individual were retained. Following this criterion all the ten thematic categories were retained,

The final Resilience Test Battery consists of four scales namely Adversity scale (49 items and three dimensions of severity, frequency, and duration), Protective factors (24 items), Promotive factors (14 items), and Achievement scale (10 items).

**Phase III: Testing the Final Battery and Arriving at a composite Resilience Index:** The purpose of developing a Resilience Test Battery is to evolve a composite score of resilience using the scores of all the scales in the battery. Phase III involved administering the Resilience Test Battery on a sample, computing scores for each scale, developing weightages, application of the formula for arriving at the composite score of resilience.

Sample: A sample of 200 adults ranging in age group (19-39years) from both the gender (men = 47.5% and women = 52.5%) from different educational background (higher secondary = 15.5%, undergraduates = 42%, post graduates and above = 23%, illiterate = 6%, Not disclosed = 13.5%) and belonging to different occupation (students = 10%, homemaker = 6.5%, self-employed = 3%, employed = 75.5%, unemployed = 3%, not disclosed = 2%). Marital status (unmarried = 43.76%, married = 56.24%).

Scoring, developing weightages and application of the formula are described in detail below.

**a) Scoring:** Ratings given for the items for every dimension were totalled and separate mean scores were calculated for the dimensions of severity, frequency, and duration of the Adversity scale. Mean scores were also calculated for Protective factors, Promotive factors and Achievement scale following the same procedure. Resilience Test Battery gave a total of six mean scores for each individual.

**b) Deriving the weighted means:** The weighted mean score was calculated for every participants for each of the three dimensions of Adversity, the scales of Protective factors, Promotive factors and Achievement and by using the following formula

$$\text{Weighted mean} = \frac{\text{Mean score of the dimension}}{\text{Weight of the dimension}} \times 100$$

Where,

Mean score of the dimension = the mean score obtained by the individual for the dimension

Weight of the dimension = the highest mean score in the data set obtained by any individual on that dimension.

The rationale for taking the highest mean score from the data set can be explained in following terms. Resilience as per Hariharan-Rana model (2017) refers to excellence amidst high adversity. The parameters of adversity, operating factors, and achievement need to be ideally high. In other words, the individual should be facing high adversity, possessing high protective factors (in terms of positive personal characteristics), having high promotive factors (in terms of high positive factors in the environment) and showing high

*A Holistic Approach to Measuring Resilience: Development and...* A. Rajendran, M. Hariharan & C. R. Rao achievements. Hence, the highest score of the data set considered as ‘ideal’ is taken as the standard.

Though the Protective Factors and Promotive Factors are scored separately, while applying the formula their scores are combined and treated as ‘Operating Factors’ because they operate as buffer against the adversity to resist the impact of adversities on the individual. They are combined under the nomenclature of ‘Operating Factors’.

Applying the formula mentioned above, the weighted mean scores were calculated for every participant on severity, frequency and duration of Adversity scale, Operating factors (Protective and Promotive factors) and Achievement scales separately. For the sake of clarity and explanation, the means and weighted mean scores of five randomly picked subjects from the data set are presented in Table 1

Table 1: Mean and Weighted mean scores of the five subjects on the six parameters of resilience

Participant	Adversity severity	Adversity Frequency	Adversity duration	Protective factors	Promotive factors	Achievement
1	0.41 (16.67)	0.41 (17.54)	0.41 (16.00)	2.00 (24.24)	2.29 (28.83)	0.90 (30.00)
2	0.53 (21.67)	0.53 (22.81)	0.53 (20.80)	2.83 (34.34)	3.07 (38.74)	0.90 (30.00)
3	0.59 (24.17)	0.59 (25.44)	0.59 (23.20)	1.71 (20.71)	1.71 (21.62)	1.00 (33.33)
4	0.69 (28.33)	1.00 (42.98)	0.98 (38.40)	4.42 (53.54)	7.00 (88.29)	1.00 (33.33)
5	0.76 (30.83)	0.76 (32.46)	0.76 (29.60)	1.67 (20.20)	1.21 (15.32)	0.00 (0.00)

*Note: The figures in the parenthesis refer to weighted means*

**c) Deriving indices and evolving the formula:** The next logical step was to derive separate indices for the three major components viz. Adversity, Operating factors and Achievement factors, using the weighted mean scores. Achievement is called the ‘Outcome Factor’ because it is the outcome in terms of performance. At the outset it is relevant to explain the difference between a mean score and an index. Mean scores indicate on an average the score of an individual on a single parameter whereas, an index is a composite value that measures the changes in a representative group of individual data points. It is a compound measure that aggregates multiple indicators. Index involves the score obtained for the parameter and the weight of the parameter. Using this, the indices were calculated for each parameter for every participant in the sample.

i) Adversity Index (AI): This was calculated using the scores of severity, frequency and duration of the adversities experienced by the participants by using the following formula-

$$AI = \frac{(S_{wm} \times S_w) + (F_{wm} \times F_w) + (D_{wm} \times D_w)}{S_w + F_w + D_w}$$

Where,

AI = Adversity index

$S_{wm}$  = Severity weighted mean of the individual

$S_w$  = Weight of Severity

$F_{wm}$  = Frequency weighted mean of the individual

$F_w$  = Weight of frequency

$D_{wm}$  = Duration weighted mean of the individual

$D_w$  = Weight of Duration

ii) Operating Factors Index (OFI) – Operating Factors Index is a combination of Protective and Promotive factors. OFI was calculated for every participant using the following formula

$$OFI = \frac{(PR_{wm} \times PR_w) + (PM_{wm} \times PM_w)}{PR_w + PM_w}$$

Where,

OFI = Operating Factors Index

$PR_{wm}$  = Protective factors weighted mean

$PR_w$  = Weight of Protective factors

$PM_{wm}$  = Promotive factors weighted mean

$PM_w$  = Weight of Promotive factors

iii) Outcome Index (OI) –The Outcome Index is calculated by using the weighted mean scores of Achievements. The following formula was applied.

$$OI = \frac{ACH_{wm} \times ACH_w}{ACH_w}$$

Where,

OI = Outcome Index

$ACH_{wm}$  = Achievement weighted mean

$ACH_w$  = Weight of Achievement

Using the above formula every participant got an Outcome Index (OI)

iv) Derivation of Resistance Index (RSI) — The concept of Resistance Index was construed taking into consideration Richardson's (2002) Meta theory of resilience where he discussed about the protective factors acting as buffers against adversities negatively impacting the

individual's biopsychosocial homeostasis. Resilience is an outcome of curious interaction between the adversities and operating factors. This interaction indicates the application of resistance, by the operating factors against the adversities. For example, a higher score on protective and promotive factors would enhance the Operating Factors Index. Resistance index is proportional to operating factors and inversely proportional to the adversity. Thus, it is a ratio of operating factors and adversity. When the Operating Factors Index is higher than the Adversity Index, the resistance against yielding to adversity is expected to be higher. This resistance factor needs to be quantified. This was done by applying the following formula.

$$RSI = \frac{OFI}{AI} \times 100$$

Where,

RSI = Resistance Index

OFI = Operating Factors Index

AI = Adversity Index

v) Resilience Index (RI)—

Resilience index is proportional to Outcome index and inversely proportional to Resistance index. Thus, it is a ratio of Outcome index and Resistance index.

$$RI = \frac{OI}{RSI} \times 100$$

Where,

RI = Resilience Index

OI = Outcome Index

RSI = Resistance Index

We can explain the Resilience index by applying Hariharan-Rana Synergy model of Resilience. If the Resistance is equal to the Outcome, the level of Resilience would be indicated as average (a score of 100). This helps the individual in insulating oneself from the negative impact of adverse life conditions. These individuals are successful survivors of adversity (Borderline Resilient). When the Outcome Index (measured in terms of Achievement) is more than the resistance applied against adversities, the level of resilience would be more than 100, indicating that the individuals not only managed to survive the adversities but also went a step ahead by manifesting excellence in life achievements.

The resilience score was computed for every participant.

#### **Phase IV—Validation of the Resilience Battery:**

Resilience Battery was validated by correlating the scores with the following three scales.

- a. General Self Efficacy Scale (Schwarzer & Jerusalem, 1995): The General Self Efficacy scale is a 10-items scale with robust psychometric properties (reliability being 0.76 and 0.90). It is a 4-point Likert scale with responses ranging from “Not at all true” to “Exactly true”. The construct of resilience is understood to be positively related to self-efficacy. This scale is used to test the convergent validity
- b. Learned Helplessness Scale (Quinless & Nelson, 1988): The Learned Helplessness Scale is a 20-item scale with reliability of 0.85. It is a 4-point Likert scale with responses ranging from “Strongly disagree” to “Strongly agree”. Learned Helplessness is used to test the discriminant validity of the battery as it is a construct different to resilience.
- c. Resilience Scale (Wagnild and Young, 2009): The Resilience scale is a 14 item scale with the reliability of 0.93. It is a 7-point semantic differential scale with responses ranging from “Disagree-Agree”. Resilience scale is used as a parallel tool to test concurrent validity. Three separate correlations were computed between Resilience Index and scores of each of the three scales.

The sample of 200 participants were administered these three scales in addition to the Resilience Battery.

Results revealed a significant positive correlation between Resilience Index and General Self Efficacy scale ( $r = 0.52$ ,  $p < 0.01$ ) proving convergent validity.

A non-significant correlation between Resilience Index and Learned Helplessness Scale ( $r = 0.12$ ) proved divergent validity. According to Campbell and Fiske (1959) measures of related constructs ought to correlate with each other significantly (indicating convergent validity) while measures of unrelated constructs ought not to correlate with one another if the measures are valid, thus, discriminating between dissimilar constructs.

Concurrent validity was proved through a significant positive correlation between the scores of the Resilience Battery and the scores of the Resilience Scale (Wagnild, 2009) ( $r = 0.57$  ( $p < 0.01$ )).

Reliability test—The reliability of the Resilience Battery was tested using Test-Retest method.

Sample: A sub sample of 50 participants from among the sample of 200 were administered the Resilience Battery for the second time with a gap of two weeks. The responses on these two tests were correlated. The adversity scale indicated a high reliability on the dimensions of severity ( $r = 0.92$ ,  $p < 0.01$ ), frequency ( $r = 0.88$ ,  $p < 0.01$ ) and duration ( $r = 0.94$ ,  $p < 0.01$ ). The reliability was high for the Protective factors scale ( $r = 0.75$ ,  $p < 0.01$ ) and Promotive factors scale ( $r = 0.93$ ,  $p < 0.01$ ). The reliability was also found to be high for Achievement scale ( $r = 0.92$ ,  $p < 0.01$ ).

**Discussion:** The objective of this study was to develop a Resilience Test Battery along the Hariharan-Rana Synergy Model and validate the same. The objective is attained by following an innovative path of using the data set and computation. Measuring resilience

from holistic perspective through a battery rather than a single scale is one of the first attempts. Further, evolving a formula capturing the resilience index with steps that meticulously follow the process is an innovative technique. For example, deriving the resistance score from the adversity index and operating factor index and then finding the ratio between the outcome factor index and resistance index to arrive at resilience index in a way follows the trajectory of resilience from adversity to resilience.

The Synergy model of resilience argued that the process of resilience involves the operation of protective and promotive factors as a force of resistance against the negative impact of adversities so that the individual shows high achievements in the face of high adversities.

The formula for computing a composite Resilience Index was conceived taking the process of resilience into cognizance. Assigning weightages for every parameter by taking the highest score of the data set was in line with the concept of 'high achievement amidst high adversities through high resistance' which is the crux of the definition of resilience as per Synergy model.

The attempt of the REST Battery has been to measure all components of resilience in their totality. For example, the adversity scale measures the component on three dimensions encompassing the subjective and objective aspects of the construct. The severity dimension is a subjective assessment that involves the experience-based judgement, while the frequency and duration are objective assessments involving temporal aspects that are objective. This complies with Mehrotra, Narayanan and Tripathi (2018) who argued that assessment of adversity should include the features like its severity, chronicity (duration) and number of risk factors should be measured.

The last part of the formula tests the two functions of resistance propounded by Hariharan-Rana Synergy model. The model postulated that the resistance either helps the individual insulate oneself from the negative impacts of adversity or empowers one to restructure one's adverse environment (Hariharan and Rana 2017, p 29). According to the model the level of achievement depends upon the force of resistance. In this study, the formula that measures the ratio between the outcome index and resistance index implies that when the outcome in terms of achievement is higher than the Resistance Index, the Resilience Index would be higher than 100. When the Resistance Index is higher than the Outcome Index the Resilience Index will be less than 100 suggesting that the efforts using operating factors to encounter the adversities was just short of insulating oneself from yielding to the adversities. Thus, the formula leaves a scope to categorise the participants on the level of resilience in terms of Resilient (RI = 100 or above) and 'Border line Resilient (RI = 80-99). The possibility of this categorization is very important in view of the scope it provides to identify and plan interventions for those who are found in the borderline.

The study successfully validated the Resilience Test Battery (REST) along the lines of Synergy Model of Resilience with good reliability and validity scores. This has to be treated as initial validation. Further studies should apply the REST Battery on larger population and match the scores with qualitative data.

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