Higher Education and Oriental Studies (HEOS) – Vol 1(4): 35 – 44
www.heos.asia/ojs
e-ISSN 2785-9118
http://doi.org/10.54435/heos.v1i4.31

A Critical Review of Adversity Quotient Instruments: Using the Cosmin Checklist

YANG DI
University of Malaya, Malaysia
yangdi0917@163.com

ABSTRACT

Adversity intelligence and adversity quotient is the critical ability and robust predictor of a person's success. However, no consensus and generalized instrument have been established. Hence, the study aims to assess the methodological quality and measurement features of the existing tools for adversity intelligence by identifying and evaluating the instruments following the consensus-based standards for selecting health measurement instruments (COSMIN) checklist. From 255 research studies, six tools were eligible by a systematic review of online databases and books. For three or more of the nine COSMIN criteria, only two of the instruments had strong to moderate levels of evidence. Meanwhile, none of the instruments met any of the criteria. These results demonstrate that no single instrument outperforms all others in all circumstances. Tools that will be refined in the future should capture the development, methodology, and quality during the development of the instrument and achieve a high measurement quality and a generalized tool of measuring adversity intelligence.

Keywords: critical review; adversity intelligence; adversity quotient; instruments

INTRODUCTION

Dealing with adversity is an essential ability in one's life. Such capability is called adversity intelligence. The score of the ability to face hardship is called the adversity quotient (Stoltz, 1997; Stoltz & Weihenmayer, 2010). Individuals who have a lower ability to face difficulties are more likely to develop depression, anxiety, and even suicidal behaviour (Feng, 2008). The GBD 2017 Disease and Injury Incidence and Prevalence Collaborators reported that more than 264 million people of all ages suffer from depression globally. It means that many people have the relatively low ability in the face of setbacks and adversity. However, this ability does have the necessary capacity to maintain mental health and success in life. Therefore, adversity intelligence and adversity quotient must be got more attention and can be measured.

Despite the establishment of potent instruments for measuring adversity intelligence, scientific gaps regarding instruments remain. First, only a few instruments have been developed in previous research (Stoltz, 1997; Lu, 2002). Less attention has been given to the development of instruments for measuring adversity intelligence. Hence, no universal instrument can be generalized until now. Second, no review has evaluated the existing measurement instruments for adversity intelligence, and agreement on the best methodological quality and measuring qualities provided by instruments have not been achieved. Meanwhile, methodological quality determines the strength of evidence for each instrument, and measurement features are primarily unknown.

Using the consensus-based standards for selecting health measurement instruments (COSMIN) checklist, this work seeks to systematically and critically evaluate the methodological quality and measurement features of available adversity intelligence instruments (Mokkink et al., 2010).

The COSMIN checklist initiative seeks to streamline the selection of high-quality patient-reported outcome measures for clinical applications and provide a detailed guideline for a systematic review of these measures (Prinsen et al., 2018). According to Mokkink et al. (2010), the COSMIN checklist can be used to assess the quality of a study on a single

measurement instrument or to compare the measurement properties of multiple measurement instruments in a systematic review.

Therefore, this study systematically and critically assessed, compared, and interpreted the methodological quality and measurement properties of published adversity intelligence measurements using the COSMIN checklist. In addition, it examined the strength of the evidence for these instruments for research use and determined which measures were able to measure adversity intelligence.

METHODS AND MATERIALS

DEFINING THE ADVERSITY INTELLIGENCE AND ADVERSITY QUOTIENT

Stoltz first defined the adversity quotient as a score that measures the ability to turn obstacles into an opportunity (Stoltz, 1997). Subsequently, Stoltz and Weihenmayer (2010) amended that the ability to deal with adversity is called adversity intelligence. Specifically, it refers to the ability of an individual to withstand blows and pressures in a situation of frustration and to escape and resolve difficulties to avoid psychological and behavioural disorders.

Li and Chen (2009) modified the definition of adversity intelligence as the individual's cognition, inference, and evaluation of his psychology and behaviour in the face of adversity and the belief or attitude to trouble (p.45). This concept correctly defines adversity intelligence as a synthesis of cognition, faith, and attitude.

Fauziah (2014) further explained that adversity intelligence refers to a person's ability to control and overcome difficulties and to suffer by analysing the source of external problems, taking responsibility for problems, effectively limiting the impact of issues on life, and having a specific endurance for difficulties or circumstances. In this review, the study focused on measuring the four primary constructs based on the definition proposed by Stoltz (1997).

SEARCH STRATEGY AND DATA EXTRACTION

To identify adversity intelligence and adversity quotient instruments, a systematic search strategy was adopted following the "preferred reporting items for systematic review and meta-analysis protocols" (PRISMA-P) (Shamseer et al., 2015). A systematic search of four electronic databases, namely, Web of Science, Scopus, ScienceDirect, and CNKI, were performed using the following keywords: adversity intelligence and adversity quotient. The search was limited to items written in English and Chinese that were published between May 2000 and May 2021. Only instruments that measured adversity intelligence or adversity quotient were considered. By snowballing, the bibliographies of selected publications were examined to find other relevant tools.

METHODOLOGICAL AND MEASUREMENT QUALITY ASSESSMENT

The COSMIN checklist consists of four steps. The first step entails evaluating measurement properties in the article: internal consistency, reliability, measurement error, content validity, structural validity, hypothesis testing, cross-cultural validity, criterion validity, responsiveness, and interpretability. Then, the second step determines whether the statistical method used in the article is based on CTT or IRT. The third step determines whether a study meets the standards for good methodological quality. Lastly, the fourth step determines the generalizability of the results. Measurement quality ratings for each instrument were determined according to the COSMIN taxonomy, internal consistency, reliability, measurement error, content validity, structural validity, hypothesis testing, cross-cultural

validity, criterion validity, and responsiveness, which were scored on a four-point rating scale (poor, fair, good, and excellent). Meanwhile, the interpretability and generalizability were rated as a dichotomous response (yes and no) (Terwee et al., 2012). The standard for evaluating the methodological quality is described in Table 1.

TABLE 1. Criteria for a quality rating of measurement properties

Measurement properties	**Criteria for rating**
Internal consistency	Cronbach's alpha is ≥ 0.70
Reliability	The intraclass correlation coefficient for continuous variables or weighted kappa for ordinal variables is ≥ 0.70
Measurement error	The smallest detectable change (SDC) is less than the minimal important change (MIC) or if the MIC is outside the limit of agreement.
Content validity	The items are relevant to the construct being measured.
Structural validity	Factor analysis shows that the instrument items explain more than 50% of the total variance.
Hypothesis testing	An adequate description provides the comparator instruments for convergent validity (≥0.5), and the design and statistical methods are adequate for the hypothesis to be tested.
Cross-cultural validity	Factor analysis, logistic regression, or item response theory techniques detect a differential item function between the instrument's two or more language groups.
Criterion validity	The criterion can be used or be considered a reasonable "gold standard."
Responsiveness	The correlation between the scores and the change scores under the receiver operator curve (ROC) can be calculated.
Interpretability	Information on norm scores, floor or ceiling effects, and minimal important change are described.
Generalizability	Data on the characteristics of the study population and sampling procedure are extracted.

THE STRENGTH OF EVIDENCE ASSESSMENT

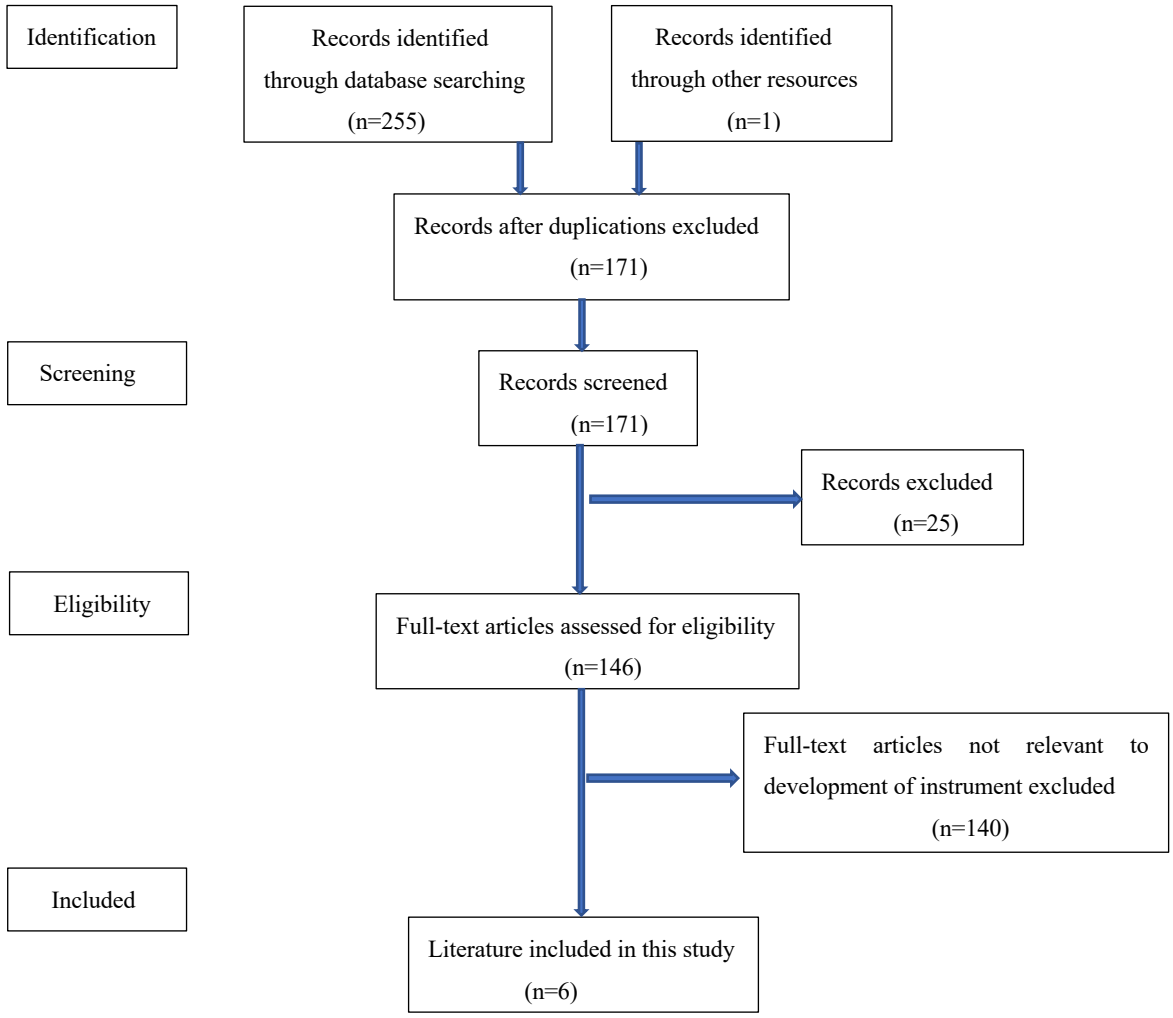
The item was scored, and a total score was produced by adding the scores of all completed items and dividing this sum by the number of finished items. Based on the methodological and measurement quality, the number and consistency of results, and the overall score between measurement studies of each instrument, the level of evidence for each instrument was classified as strong, moderate, limited, conflicting, and unknown. Several methodologically good or excellent articles showing consistent evidence for or against measurement qualities were considered strong evidence. According to moderate evidence, numerous methodologically fair or one good study emerged, whereas only a minimal amount of evidence was assigned.

FINDINGS

Two hundred fifty-five articles were selected, analysed, and evaluated for eligibility, thus

yielding seven studies and representing adversity intelligence and adversity quotient measurement instruments (Figure 1).

FIGURE 1. Flowchart of search strategy showing the numbers of included and excluded articles



CHARACTERISTICS OF ADVERSITY INTELLIGENCE INSTRUMENTS

The characteristics of the measures included are outlined in Table 1. All the instruments were self-reported, while the objectives' adversity intelligence and adversity quotient were retrospectively measured based on consensus. The Adversity Response Profile (ARP) was studied and applied to different groups more widely than Lu Xi's scale in these two instruments. ARP was developed in English and was also adapted and translated into other languages. Meanwhile, Lu Xi's scale was developed in Chinese. These instruments were developed and evaluated without using classical test theory or item response theory. However, as scholars began to pay increasing attention to adversity ability, the scale was further tested and evaluated using exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and the Rasch model. The description and process are listed in Table 2 and Table 3.

Stoltz (1997, 1998) first developed a theoretical perspective on adversity intelligence in a cognitive process and an adversity quotient instrument. Both have been accepted and used by psychologists, scholars, educators, and others interested in understanding adversity

intelligence, adversity quotient, and the function and importance of adversity intelligence. The ARP is the first instrument to conceptualize adversity intelligence and measure the cognitive process. It was established from 27 business and academic units across the United States and presented 60 items that describe potential behaviours in 30 hypothetical scenarios; 15 hypothetical scenarios, including 30 items, represent control, original, and ownership; and 15 other hypothetical scenarios, including 30 items that describe their reach and endurance. In each hypothetical scenario, two items express two aspects of the constructs of adversity intelligence. Respondents will rate and select the possible behaviour of each item on a five-point Likert scale. The items were labelled 1 (no control) to 5 (complete control) in the control items. 1 (me) to 5 (other people or factors) in the original and ownership items, 1 (relates to all aspects of my life) to 5 (just relates to this situation) in items regarding reach, and 1 (always exist) to 5 (never exist again) in items regarding endurance. Stoltz classified three types of people based on the score of the adversity quotient people encounter along their journey up a mountain: the quitter, the camper, and the climber.

The present overwhelming majority of researchers used Stoltz's (1997) model and instrument as the theoretical basis for their research in their adversity quotient studies (Hidayat et al., 2018; Lee et al., 2017; Verma et al., 2017; Matore et al., 2018; Mohd Matore et al., 2020; Mohd Matore & Zamri Khairani, 2020). The theory concerns the cognitive process of facing adversities in the western context. Although the constructs may be universal, individuals and various background groups differ substantially in dealing with adversity. The items in the scale of adversity intelligence need a change in which the school environment is different from the work environment. The individuals and groups have other cognitions of adversity. These factors suggest a need to modify the constructs and form a universal theory of adversity intelligence.

In the second instrument, which started with Stoltz's (1997) measure of adversity quotient, Lu (2002) believed that the standard way to measure the adversity quotient is to complete self-reported questionnaires. He suggested that experts and scholars combine local social politics, economic, historical, cultural traditions, knowledge structure. Unlike ARP, Lu Xi's scale was first submitted based on the five-factor model and was divided into five subscales: A: individual behaviour patterns; B: talent and desire; C: intelligence, health, and character; D: belief; and E: response to adversity. Twenty items used a five-point Likert scale in each subscale and 100 items in the total scale. The highest score for each scale was 100 points. Each subscale was scored separately. The adversity quotient was determined using the average score of the sum of five subscale scores. A total score less than 50 indicated a low level of adversity quotient; 50–69 points were under the vigilance level; 70–89 points comprised the ideal level, and 90–100 points indicated that the adversity quotient level was very high. As long as a subscale score was low, the adversity quotient level was low even if the total score was high. However, Lu Xi's scale had no specific population description, reliability, and validity. Moreover, it had not been widely used and confirmed. Although the reliability and validity of the scale were not endorsed and the research about Lu Xi's scale was also limited, the factors of the adversity quotient proposed by the author could be the source of the items on the adversity intelligence in this study.

TABLE 2. Characteristics of developed instruments of adversity intelligence

Author (Year)	Name	Country	Objective	Subscale	Mode

Stoltz (1997)	Adversity Response Profile (ARP)	USA	18–75-year-old adults	Control Original and ownership Reach Endurance	Self-report
Lu Xi (2002)	Lu Xi's scale	China	No specific description	Individual behavioural patterns Talent and desire Intelligence, health, and character Belief Response to adversity	Self-report

TABLE 3. Study of testing developed instruments

Author (Year)	**Developed instruments**	**Country**	**Participants**	**Measurement information**
Li & Chen (2009)	Adapted ARP	China	Primary, Junior high, High school, and College students	EFA
Mohd Matore, Zamri Khairani, & Adnan (2019)	ARP1	Malaysia	Youth	EFA
Mohd Matore, Zamri Khairani, & Abd Razak (2020)	ARP2	Malaysia	Polytechnic students	Rasch model and CFA
Mohd Matore, & Zamri Khairani (2020)	ARP3	Malaysia	Technical students	Rasch Model

METHODOLOGICAL AND MEASUREMENT QUALITY

Table 4 summarizes the methodological and measurement quality of the eligible studies for each criterion. Internal consistency, reliability, measurement error, content validity, structural validity, hypothesis testing, cross-cultural validity, criterion validity, and responsiveness were assessed using a scored system. Interpretability and generalizability were assessed using a dichotomous response. Based on the checklist, none of the instruments identified could be evaluated for all criteria. These tested instruments, in particular, had information about their internal consistency (4), five instruments reported their reliability (5), and none of the instruments showed the measurement error in the study process (0), three instruments presented the content validity (3), four instruments give the structural validity(4), four instruments tested hypotheses (4), only two instruments for cross-cultural validity (2), only one instrument has tested the criterion validity (1), none of the instruments has mentioned responsiveness(0), and three instruments has generalizability (3).

TABLE 4. Methodological and measurement properties of the instruments

Instruments	Methodological and measurement quality											Strength of evidence
	Internal consistency	Reliability	Measurement error	Content validity	Structural validity	Hypothesis testing	Cross-cultural validity	Criterion validity	Responsiveness	Interpretability	Generalizability	
I1	2	2	0	0	0	0	0	0	0	+	+	36%
I2	0	0	0	0	0	0	0	0	0	?	?	0
I3	0	3	0	3	3	2	2	3	0	?	?	55%
I4	3	3	0	3	2	3	0	0	0	?	-	45%
I5	3	3	0	3	3	3	0	0	0	?	+	55%
I6	3	3	0	0	2	2	1	0	0	+	+	55%

I1: ARP, I2: Lu Xi's scale, I3: Adapted ARP, I4: ARP1, I5: ARP2, I6: ARP3

Measurement quality: 0: poor, 1: fair, 2: good, 3: excellent, +: adequate, -: not adequate, ?: unclear

THE STRENGTH OF INSTRUMENTS ASSESSMENT

Table 4 presents the strength of evidence for each instrument. None of the instruments had strong to moderate evidence for all 11 COSMIN criteria, and none of the criteria was met by all instruments. In addition, no substantial evidence was found for criterion-related measurement error, cross-cultural validity, criterion validity, and responsiveness in any of the instruments evaluated. The adapted ARP, ARP2, and ARP3 had the same strongest evidence for the COSMIN criteria, as ARP and ARP had moderate evidence. Meanwhile, Lu Xi's scale was uncertain due to the lack of verification of the methodological quality and measurement features.

DISCUSSION

This research uses the checklist containing standards to assess the methodological quality of the measurement qualities of adversity intelligence or adversity quotient. The COSMIN checklist helps separate the evaluation of the methodology quality of a study to develop an instrument. The COSMIN list is meant for evaluating the methodological quality of a survey of the measurement properties of an instrument, not for assessing the quality of the instrument itself. The criteria in the COSMIN checklist are produced by the Delphi method, which is a valuable tool for evaluating the methodological quality of a study on the measurements properties of an instrument, not for assessing the quality of the instrument itself. Researchers have not reached a consensus on the criteria in several varying opinions, and adequacy has not been included. This assessment method is not used widely, and the adequacy in standards can be obtained in the future.

Regarding adversity quotient or adversity intelligence instruments, few instruments have directly measured the level of the adversity quotient, which does not have sufficient theoretical or empirical evidence to support it. Research on adversity intelligence or adversity quotient have received less attention from researchers due to the following factors: (1) understanding of the concept is vague, and the usage of similar terms, such as psychological resilience, and adversity intelligence, is ambiguous and wrong because they have been used interchangeably; (2) the concept of adversity intelligence has some conflict issues; and (3) the validity and reliability of scales are always in conflict.

The previous instruments of subjects include students, workers, nurses, athletes, and others. The different abilities of learning, different environments, different life experiences, and cognition lead to different cognition and reaction to adversity. Thus, the subjects must be classified. As far as students are concerned, the primary school stage is the first step for children to move from family to school. Behaviour has changed from unfettered to local rules and regulations, and daily activities have changed from play to study. Pupils are prone to fear and helplessness at this stage, which can even endanger their mental health. Middle school students belong to adolescence, which is crucial for forming their worldview, outlook on life, and values. In this period, the strict requirements of teachers, the high expectations of parents, the continuous development of academic difficulties, and a series of pressure are likely to lead to students' rebelliousness, weariness, and other phenomena. The higher education stage, such as undergraduate students, is the process from school to society, including academic pressure in university, interpersonal relationships, departure from their safe ivory tower into the unknown community environment, etc. This series of tremendous pressure is complex for undergraduate students to handle. Therefore, various populations must be classified in future research.

CONCLUSION

Overall, the results of this critical review and appraisal of measurement instruments for adversity quotient indicate that no single instrument is superior to all others in all circumstances and groups. Several instruments have moderate to strong evidence for methodological quality, and measurement properties can be appropriate for specific research questions. The current analysis further indicates that to develop an instrument of adversity intelligence to meet the criteria as many as possible is required.

REFERENCES

Fauziah, N. (2014). Empati, Persahabatan, dan Kecerdasan Adversitas Pada. Mahasiswa. Yang Sedang Skripsi. *Jurnal Psikologi Undip*, *13*(1),78-92.

Feng, Y. (2008). Importance of adversity quotient in postgraduate students' growth. *Journal of. Nanjing Institute of Technology (Social Science Edition), 8*(1), 65-68.

GBD 2017 Disease and Injury Incidence and Prevalence Collaborators. (2018). *Global, regional, and national incidence, prevalence, and years lived with disability for 354 diseases and injuries for 195 countries and territories, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017*. The Lancet.

Hidayat, W., Wahyudin, & Prabawanto, S. (2018). It is improving students' creativity. Mathematical reasoning ability students through AQ and argument-driven inquiry learning. 1st International Conference of Education on Sciences, Technology, Engineering, and Mathematics (Ice-Stem), 948.

Lee, M. F., Nawi, N. F. M., & Lai, C. S. (2017). Engineering students' jobs. Performance. prediction model based on adversity quotient & career interest. 2017 7th World Engineering Education Forum (Weef), 132-135.

Li, B. Q. & Chen, C. R. (2009). Research on adversity quotient, coping style, and depression. *Medicine and Philosophy, 30*(10), 44-46.

Lu, X. (2002). *Adversity quotient: let adversity quotient overcome adversity*. Beijing: China Braille Press.

Matore, M. E. E. M., Khairani, A. Z., Razak, N. A., & Maat, S. M. (2018). Assessing the quality of items measuring adversity quotient among mechanical engineering students using the Rasch model. *Proceedings of Mechanical Engineering Research Day,* 2018 (Merd), 189-190.

Mohd Matore, M. E. E., & Zamri Khairani, A. (2020). The Measurement Properties of Adversity Quotient (AQ) Items for TVET Education using Rasch Model. *Journal of Technical Education and Training, 12*(3), 61-70.

Mohd Matore, M. E. E., Zamri Khairani, A., & Abd Razak, N. (2020). Development and Measurement Properties of the Adversity Quotient Scale: An Analysis using Rasch Model and Confirmatory Factor Analysis. *Revista Argentina de Clínica Psicológica, XXIX,* (5), 574-591.

Mokkink, L. B., Terwee, C. B., Patrick, D. L., Alonso, J., Stratford, P. W., Knol, D. L., Bouter, L. M., & De Vet, H. C. (2010). The COSMIN checklist for assessing the methodological quality of studies on measurement properties of health status measurement instruments: an

international Delphi study. *Qual. Life Res. 19* (4), 539–549.

Prinsen, C., Mokkink, L., Bouter, L., Alonso, J., Patrick, D., de Vet, H., & Terwee, C. (2018). COSMIN guideline for systematic reviews of patient-reported outcome measures. *Qual. Life Res. 27*(5), 1147–1157.

Shamseer, L., Moher, D., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P., & Stewart, L.A. (2015). Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. *BMJ 4* (1), 1–9.

Stoltz, P. G. (1997). *Adversity quotient: turning an obstacle into an opportunity.* John Wiley & Sons, Inc. Canada.

Stoltz, P. G. (1998). Do you know your AQ? Use "AQs" to assess which employees will best survive and succeed in the workplace. *Workforce*, 77(12), 58-59.

Stoltz, P. G. & Weihenmayer, E. (2010). *The Adversity Advantage.* New York: Simon. & Schuster, Inc.

Terwee, C. B., Mokkink, L. B., Knol, D. L., Ostelo, R. W., Bouter, L. M., de Vet, H. C. (2012). Rating the methodological quality in systematic reviews of studies on measurement properties: a scoring system for the COSMIN checklist. *Qual. Life Res. 21* (4), 651–657.

Verma, S., Aggarwal, A., & Bansal, H. (2017). The relationship between emotional intelligence (EQ) and adversity quotient (AQ). *IOSR Journal of Business and Management*, 19(01), 49-53.

ABOUT THE AUTHOR

Yang Di graduated from Henan University with a master's degree in Applied Psychology. She is currently enrolled in the PhD programme at the Faculty of Education, University of Malaya. Most of Yang Di’s research involves the field of counselling and psychometric psychology.