ORIGINAL ARTICLE

Mental Strength Scale (MSS-9): Factor structure and reliability

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ABSTRACT

Mental strength represents a person's ability to persist through obstacles and recover from failures. The Mental Strength Scale was first developed as a simple tool for field applications for coaches and mental performance practitioners to determine strategic plans to improve a person's mental strength. Study 1 aimed to assess, via confirmatory factor analysis, the Mental Strength Scale factor structure in a sample of Brazilian jiu-jitsu and judo athletes. Sample 1 included 630 combat sports practitioners (79.7 % males), representing 420 Brazilian jiu-jitsu and 210 judo participants from 18 to 60 years of age. Results indicated that the hypothesized factor structure was not a good fit for the data. As a result, Study 2 was conducted to propose modifications to the scale and reassess its structure via exploratory factor analysis in a sample of the general population. Sample 2 included 316 representatives of the United States general population (68% male) from 21 to 60 years of age. Based on the EFA, a one-factor solution is championed, with nine items retained (Appendix A). Cronbach's alpha of .81 was computed for the retained items, indicating good internal consistency and reliability. Future studies are encouraged to conduct follow-up confirmatory factor analyses to provide construct validity support for the factor structure of the Mental Strength Scale (MSS-9).
Keywords: Resilience, Perseverance, Grit, Performance, Mental toughness.

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INTRODUCTION

Measuring mental strength has been target of discussion for several years (Clough et al., 2002; Van Haitsma et al., 2018). In 1918, Major Robert M. Yerkes proposed the development of psychological centres to assess mental strength in military personnel (Yerkes, 1918). Since then, many instruments have been developed to assess mental performance-related variables (Clough et al., 2002; Duckworth et al., 2007; Smith et al., 2008; Van Haitsma et al., 2018). However, until recently there has been a lack of clarity regarding the definition of mental strength and how to assess it (Lorenco-Lima, 2024). Moreover, the overcomplexity of some instruments through the inclusion of several constructs may decrease the objectivity of the assessment and make it unclear for mental performance practitioners what to prioritize when prescribing training plans to optimize mental strength. To overcome these barriers, the Mental Strength Scale was initially designed as a simple tool for field application for mental performance practitioners to determine strategic plans to improve mental strength.

Mental strength definition

Initially, mental strength was discussed as involving two components: perseverance and resilience. Derived from the Latin word *perseverant* (abiding by strictly), perseverance represents one's persistence in pursuing a task regardless of difficulty (Dagnall et al., 2019). Resilience is derived from the Latin word *resile* (*re* = back and *salire* = to jump) and represents one's ability to recover from hardships (Smith et al., 2008). Stemming from these concepts, Lorenco-Lima (2024) defined mental strength as one's ability to persist through obstacles and recover from failures. The relevance of mental strength is based on the notion that the ability to persevere despite barriers and setbacks is one of the qualities people most admire in others (Csikszentmihalyi et al., 2005).

Mental strength conceptualization

Mental strength is best understood through a parallel with well-established concepts and biological training principles in sports science. The adoption of language compatible with sports science may facilitate comprehension, increase acceptance, and decrease stigma among the general population. For instance, to increase muscular strength, muscle fibres must be stressed beyond their current capacity to expand their functionality (Malm et al., 2019). Similarly, the brain must be stimulated beyond its current capacity in order to expand its functionality. Therefore, the improvement of mental strength follows the biological training principles outlined below.

Overload principle

The overload principle represents one of the main factors required for muscular adaptations such as increases in muscle strength and power (Steinhaus, 1933; Kasper, 2019). The term overload describes the stimuli necessary to promote acute response and, over time, chronic adaptation (Kasper, 2019). Psychological overload specifically refers to the stimuli required to promote acute responses and chronic mental strength adaptations. An individual presenting higher mental strength will extend the time to reach psychological fatigue and shorten the recovery time after psychological fatigue.

Adaptation principle

The principle of adaptation is dependent on a person's ability to balance fatigue, fitness, and recovery and describes the process occurring after systematic applications of overloads over time leading to positive chronic adaptations (Fountaine, 2024). As a result of the principle of adaptation, extraneous psychological overloads become less taxing over time due to increased psychological efficiency (i.e., psychological fitness).

Progression principle

The principle of progression describes the increments in stimulus required to impose overload and sustain continued adaptation (Kasper, 2019). Progression must be appropriately managed through optimal control of the intensity, volume, frequency, and overall workload to prevent "*injuries*" (mental health disorders), resulting from rapid progression, or goal postponement (e.g., confidence optimization) due to a decelerated progression (Kasper, 2019).

Individuality principle

Individuality explains a person's unique ability to adapt to overloads (Schwellnus et al., 2016). Excessive psychological overloads may lead to detrimental effects such as burnout and psychological overtraining (i.e., mental health disorders).

With adequate psychological overload, adaptation, and progression, the initial mental strength baseline may be surpassed. The timeline to determine the adequate level of psychological overload and progression depends on the specificities of the individual. Adequate rest and nutrition are critical to optimizing the development of mental strength.

General and situational mental strength

Similarly to the idea of dispositional and situational elements of self-confidence theorized by Vealey (1986), mental strength can be addressed as general or situational. Situational mental strength explains the individual's behaviour in a specific domain. For instance, one may demonstrate high mental strength in athletics, but present low mental strength in scholarly activities. Moreover, although some inter-context transferability may occur, one can present high mental strength in a particular scholarly subject or sport (e.g., math or volleyball) but low mental strength in a different subject or sport (e.g., literature or judo). General mental strength describes the individual's overall behaviour across the multiple domains in life.

Mental Strength Scale

The Mental Strength Scale was developed as a self-report instrument to measure general mental strength in a sample of 431 participants, including 373 combat sports practitioners (i.e., grapplers and strikers) and 58 non-practitioners (Lorenco-Lima, 2024). The initial scale was developed as 20 items presenting adequate face validity and assessing the two components of mental strength: resilience and perseverance. Ten items were developed to address resilience by assessing the respondents' thoughts about dealing with failure (e.g., "*I'm scared of failing*"). An additional 10 items were developed to address perseverance by assessing the respondents' thoughts about facing challenges (e.g., "*I work hard to overcome challenges*"). After analysis of the internal reliability coefficients, redundancy, and clarity, eight items were dropped (e.g., retained: "*I have overcome challenges in the past*;" dropped: "*I have not overcome any challenges in the past*"). An exploratory factor analysis with the remaining items resulted in the exclusion of two additional items to retain factor loadings over .40. The resulting Mental Strength Scale (Appendix A) included 10 items (5-point Likert), representing two subscales: perseverance (facing obstacles) and resilience (dealing with risk of failure). Total scores were determined by the average of the ten items, with 5 representing high mental strength and 1 representing low mental strength.

STUDY 1

As part of a sequential development of the Mental Strength Scale, study 1 aimed to confirm the initially proposed factor structure in a sample of Brazilian jiu-jitsu and judo athletes. The sample was selected based on the relevance of mental strength in combat sports, where continued practice requires athletes to endure intense training and unexpected results in competitions.

METHODS

Procedures

Data collection for Study 1 was conducted from April 19 to June 29, 2024, via Google Forms. The form was distributed online via Instagram, Facebook posts, and email campaigns. Participants included in the study were male and female, from 18 to 60 years of age, with all experience levels in Brazilian jiu-jitsu and judo, currently engaged in at least one Brazilian jiu-jitsu or judo class per week. Participants answered the demographic (age and biological sex) and training-characteristic questions (combat sports style, training experience in years) followed by the Mental Strength Scale.

Study 1 was conducted anonymously, and no compensation was offered to the respondents. An information sheet was provided to the participants presenting the details of the study. The Liberty University Institutional Review Board exempted this study as outlined in 45 CFR 46:104(d): Category 2. (i). clarifying that the data obtained by the author is recorded in a way that the identity of the human participants cannot readily be ascertained directly or through identifiers linked to the participants (*Electronic Code of Federal Regulations*, 2024).

Participants

Study 1's sample included 630 combat sports participants, representing 502 males (79.7%) and 128 females (20.3%) from 18 to 60 years of age (39.13 ± 9.82). Of the total sample, 420 were Brazilian jiu-jitsu practitioners (66.7%) and 210 judo practitioners (33.3%). Brazilian jiu-jitsu practitioners reported 6.46 ± 5.92 years of experience, and Judo practitioners reported 13.91 ± 12.87 years of experience.

Materials

The Mental Strength Scale is a 10-item (Appendix A), 5-point Likert scale developed to assess the athlete's mental strength (Lorenco-Lima, 2024). Participants were asked to mark the response that best represented their thoughts and behaviours over the past month. Items 3, 6, 7, and 10 were positively worded, with 1 representing "*strongly disagree*" and 5 "*strongly agree*." Items 1, 2, 4, 5, 8, and 9 are negatively worded and reverse coded. Questions represent two subscales, dealing with the risk of failure (items 1, 2, 4, 5, 8, and 9) and facing obstacles (items 3, 6, 7, and 10). Total scores were determined by the average of the item responses, with higher scores indicating higher mental strength. In previous studies, the Mental Strength Scale presented Cronbach's alpha of .81, in addition to convergent validity with measures of resilience and grit (Lorenco-Lima, 2024).

Analysis

Based on the hypothesized structure of mental strength construct as previously outlined, two confirmatory factor analysis (CFA) models were tested. *Model 1* was a two-factor model in which items 1, 2, 4, 5, 8, and 9 were loaded onto the Dealing with Risk of Failure (DRF) factor, and items 3, 6, 7, and 10 loaded onto the Facing Obstacles (FO) factor. *Model 2* was a unidimensional model in which all 10 items loaded onto a single mental strength factor. Maximum likelihood estimation was used for both models as this estimation method performs well in most circumstances (including when some model misspecification is present; Finney & DiStefano, 2013; Olsson et al., 1999).

Assessing model-data fit

To assess the absolute fit of the models, several statistics were examined. First is the chi-square statistic, which tests the significance of the difference between the observed and model-implied covariance matrices. Because the large sample size for this study will result in increased power, the chi-square will likely be

statistically significant even if the actual difference between the covariance matrices is negligible. Thus, additional measures were considered, including the standardized root mean square residual (SRMR), which is a standardized summary of the covariance residuals; SRMR values of .08 and below are generally considered indicative of good fit (Hu & Bentler, 1999). The root mean square error of approximation (RMSEA) assesses model misfit per degrees of freedom. Recommendations regarding cutoff values are mixed, but generally a value of .06 is considered good whereas values greater than .10 are poor (Browne & Cudeck, 1993; Hu & Bentler, 1999). Finally, the comparative fit index (CFI) was examined, which compares the model of interest to an independence (null) model. A recommended cutoff value is .95, with higher values indicating better fit (Hu & Bentler, 1998; 1999). Besides considering the chi-square value and fit indices, the residuals to assess areas of local misfit were also examined.

To assess the relative fit of the models, a chi-square difference test for the nested models was performed, which is a significance test of the difference between two chi-square values, with degrees of freedom equal to the difference in degrees of freedom between the two models. Akaike's information criteria (AIC) was also examined, which is based on deviances and provides information regarding both model fit and parsimony. Lower values are indicative of better fit (Hu & Bentler, 1998).

RESULTS

Confirmatory factor analysis

In terms of absolute fit, chi-square and fit index values are presented in Table 1. As expected, given the large sample size, the chi-square values for all four models were statistically significant. The SRMR value for the two-factor model was below the .08 cutoff, but the one-factor model was not. RMSEA for both models was poor, being greater than 0.10; and CFI values for both models were also below the 0.95 cutoff, though the two-factor model value was better than the one-factor model.

Table 1. Absolute and relative fit measures.

	χ^2	df	SRMR	RMSEA	CFI	AIC	$\Delta\chi^2$	Δdf	*p-value*
2-Factor	256.33**	34	0.070	0.102	0.864	298.33	-	-	-
1-Factor	593.65**	35	0.107	0.159	0.659	633.65	337.32	1	<.001

Table 2. Observed 2-factor model correlations (Bottom) and model correlation residuals (Top).

	3	6	7	10	1	2	4	5	8	9
3	-	-.004	-.032	-.015	.081	.254	.018	.023	.16	.073
6	.503	-	.039	-.019	-.066	.032	-.141	-.033	.027	-.052
7	.448	.553	-	.019	-.036	-.015	-.115	-.078	-.017	-.026
10	.365	.387	.404	-	.04	.067	-.082	.016	.079	.18
1	.278	.145	.164	.198	-	.072	.036	-.035	-.052	-.045
2	.429	.22	.163	.208	.444	-	-.115	-.063	.062	.041
4	.225	.081	.095	.084	.475	.275	-	.135	-.008	-.019
5	.207	.164	.109	.164	.356	.285	.545	-	-.063	-.021
8	.324	.203	.15	.211	.297	.372	.358	.263	-	.06
9	.23	.116	.134	.306	.289	.338	.331	.291	.338	-

Note. Items 3, 6, 7, and 10 loaded onto the Facing Obstacles (FO) factor. Items 1, 2, 4, 5, 8, and 9 load onto the Dealing with Risk of Failure (DRF) factor.

In terms of relative fit, the significant chi-square difference tests (see Table 1) indicate that the more parsimonious model (e.g., the one-factor model) fits statistically significantly worse than the more complex

model (e.g., the two-factor model). Thus, the two-factor model fit best according to the relative fit information. This is further supported by the AIC values in Table 1. However, given the overall poor absolute fit of both models, the two-factor model was not considered to fit sufficiently well to champion.

In order to determine the reason for the poor misfit, patterns of observed correlations as well as the correlation residuals were examined (observed – model-implied; see Table 2). Based on this, it was determined that the issue is likely due to a little-discussed assumption of CFA models known as proportionality constraints. Proportionality constraints mean that the correlation of any two items with a third item must be proportional to the correlation of those same two items with a fourth item. The extent to which these constraints are violated will result in model misfit because the model will be unable to reproduce the correlations well. Proportionality constraint violations can be best seen via pairs of items with especially high or low correlations within or across factors, compared to other pairwise correlations (D. Bandalos, personal communication, August 6, 2024).

To observe the proportionality constraint violations in action, consider the correlation between items 2 and 3 (r = 0.429), and 9 and 10 (r = 0.306) in Table 2. Each of these two pairs of items are on opposite factors yet have higher correlations with each other than with other items on their own factor. Items 2 and 4 (r = 0.275) are in the same factor yet have the relatively lowest pairwise correlation. In contrast, items 4 and 5 (r = 0.545) have one of the highest correlations within their factor, which makes it difficult for the model to reproduce the observed correlation. These patterns may suggest some sort of method effect (e.g., items with too similar meaning) for only some of the items, thus resulting in too high and too low correlations for some pairs of items but not others. As a result, edits to the scale items were needed.

STUDY 2

Based on the poor fit of the initial Mental Strength Scale factor structure, Study 2 aimed to make edits to the scale and reassess its structure in a sample of the general population.

METHOD

Editing the scale

After examining the item content and the specific issues with the scale in Study 1, two items were dropped due to a lack of the explicit behavioural aspect of mental strength (Item 2: "*I hate challenges*" and Item 4: "*I am scared of failing*"). Additionally, some of the remaining items were rephrased to address potential issues with double-barrelled wording. Moreover, 12 additional items were developed and included to address the behavioural characteristics of mental strength, which is defined as a person's ability to persist through obstacles and recover from failures (Lorenco-Lima, 2024).

After rephrasing 8 original items (items O1 to O8) and adding 12 new items (resilience: items N1 to N6; perseverance: items N7 to N12), the new scale was ready for administration (Appendix B).

Procedures

Data collection for Study 2 was conducted from September 18 to October 23, 2024, via Google Forms. The form was distributed online via Amazon mTurk. The participants included in the study were male and female representatives of the United States general population from 21 to 60 years of age. Participants answered two demographic questions (age and biological sex) followed by the Mental Strength Scale.

Study 2 was conducted anonymously, and participants were compensated ($0.50) per form via Amazon mTurk. The necessary modifications were submitted and approved by Liberty University's Institutional Review Board.

Participants

Study 2 included 316 representatives of the United States general population, representing 215 males (68%) and 101 females (32%) from 21 to 60 years of age (32.95 ± 7.05).

Analysis

Using the data from the new sample and updated scale, a principal axis factoring exploratory factor analysis (EFA) was performed to determine what factor structure might work best with the old and new Mental Strength Scale items. A direct obliging rotation was used, which is an oblique rotation method; this means that the factors can correlate with one another, which made theoretical sense in the context of the Mental Strength Scale – that is, if there is more than one factor suggested by the EFA, it would be expected that they correlate with one another.

To determine the number of factors to retain from the EFA, consideration was given to the variance explained by each extracted factor, the scree plot (which provides a graphical representation of the factor eigenvalues), the factor pattern coefficients (i.e., loadings) for each item, and the item content/interpretability of the factor(s) identified.

RESULTS

Exploratory factor analysis

Table 3 and Figure 1 together suggest that a maximum of two factors is the likely best solution. Specifically, there is a notable "*levelling off*" of the variance explained by factor 3 and above.

Table 3. Variance explained by the first four extracted factors.

Factor	Variance explained	Eigenvalue % of variance
1	5.49	27.46%
2	2.35	11.73%
3	1.19	5.95%
4	1.08	5.39%

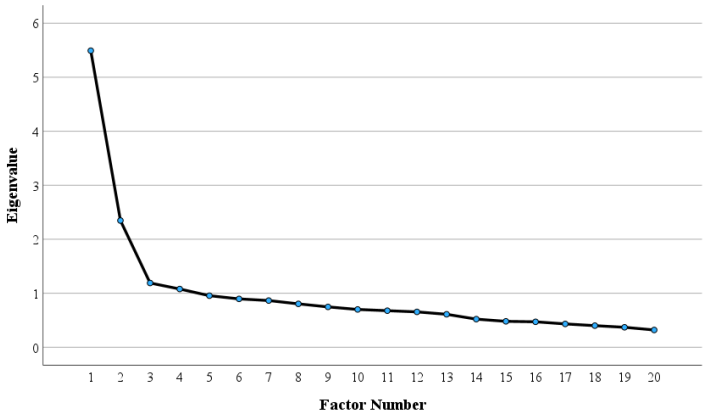

Figure 1. Screen plot for maximum number of extracted factors.

The inclusion of two factors is further supported by the factor pattern matrix (Table 4), which presents the factor loadings for each item on the first four factors. The shaded cells in Table 4 represent items with loadings on their specific factor of +0.35 or greater, indicating that the item loads onto the factor adequately. Note that items with strong loadings on factor 1 do not show strong positive loadings on any of the other factors, which is an indication of a good simple structure EFA solution. The same is true for items loading on factor 2. One exception to this pattern is item N12, which has a strong loading on factor 3 and a moderate loading on factor 1, suggesting it may be a good candidate for removal pending examination of the item content.

Table 4. Factor pattern matrix.

Item	Factor			
	1	2	3	4
N1	.467	.137	-.119	-.231
N2	.048	-.026	.013	-.474
N3	.826	-.067	-.115	.119
N4	.002	-.008	.040	-.607
N5	.504	-.036	-.036	-.168
N6	.578	-.036	.065	-.027
N7	.299	.030	.048	-.367
N8	.443	.078	.225	-.055
N9	.345	-.095	-.001	-.280
N10	.140	.064	.211	-.497
N11	.481	.047	-.056	-.096
N12	.306	.013	.477	-.172
O1	.251	.087	-.168	-.363
O2	.064	.512	-.390	.061
O3	.234	.005	-.355	-.434
O4	-.100	.780	.028	-.100
O5	.435	-.107	.175	-.044
O6	-.178	.610	.010	-.177
O7	.385	.019	.111	-.156
O8	.126	.587	.056	.192

Upon examination of the item content, a decision was made to drop the mildly cross-loading item N12. This item stated, "*I am able to stick to tasks even when they become challenging or boring*." The inclusion both adjectives "*challenging*" and "*boring*" could make the item double-barrelled. Additionally, the item seemed to be assessing a slightly different construct than the rest of the items, a conclusion that was supported by the fact it was the only item loading strongly on factor 3.

This left two factors for consideration, with factor 2 containing only four items. Examination of the item content made it immediately apparent that these four items are all negatively oriented – that is, an *Agree* response means that the respondent is *lower* on the construct of mental strength. Specifically, the items are:

- O2: I don't like to put myself in situations where I may not succeed.
- O4: Challenges make me doubt myself.
- O6: If I believe I can fail, I may not finish.
- O8: I have a hard time finding the motivation to overcome challenges.

Not only are these items all negatively oriented, but they are also in fact the only negatively oriented items on the scale. This is strong evidence that factor 2 is resulting solely from a method effect of the item wording. Although including negatively oriented items on a scale can provide benefits such as serving as an attention check or encouraging respondents to think more deeply about their responses, when these types of items cluster together in a method factor it can be argued that they are doing more harm than good. The rewording of the items to a positive orientation was considered; but ultimately, they were dropped as they do not add much to the scale in terms of the specific content they are assessing. As a result, a one-factor solution is championed, with items N1, N3, N5, N6, N8, N9, N11, O5, and O7 being retained (Appendix A).

Reliability

To provide additional support to the championed one-factor solution, Cronbach's alpha was computed for the retained items. This resulted in an alpha of .81, which represents good internal consistency reliability.

DISCUSSION AND CONCLUSIONS

Study 1 aimed to confirm the initially proposed 2-factor structure of the Mental Strength Scale in a sample of Brazilian jiu-jitsu and judo athletes. CFA results indicated that neither the hypothesized 2-factor structure nor the unidimensional model were a good fit for the data. Based on the poor fit of the initial factor structure of the Mental Strength Scale, Study 2 aimed to propose edits to the scale and reassess its structure in a sample of the general population. Based on the EFA results, a one-factor solution was championed with nine remaining items. The one-factor solution supports the idea that mental strength may be a unidimensional construct rather than being composed of resilience and perseverance as separate constructs. Thus, the Mental Strength Scale – 9 (MSS-9) is championed pending further validation using additional samples and confirmatory factor analyses (Appendix C).

The unidimensional characteristic of mental strength is supported by the idea that perseverance and resilience share a conceptual similarity that enables individuals to progress despite obstacles (Turbeville, 2021). Both constructs are essential for mustering the internal and external resources necessary to overcome adversities (Tsai & Morissette, 2022). Although conceptually different, when assessed via self-reported items, the conceptual similarities may overshadow the differences making them too subtle to generate two distinct variables.

These studies present some limitations which provide groundwork for future studies. First, further validity evidence is needed. This should include both convergent validity evidence with measures of related constructs such as resilience and grit, as well as divergent validity evidence with measures of constructs such as social responsibility. Moreover, predictive validity studies may determine the usefulness of mental strength in contexts involving performance, well-being and mental health. Additionally, as a construct that is not expected to change substantially over time, the scale would benefit from the assessment of test-retest reliability to provide further reliability evidence.

Lastly, although the exploratory factor analysis results made a compelling argument for a one-factor solution, a follow-up CFA is needed to provide support for the factor structure of the retained items. Thus, future studies using these items with a new sample should test a one-factor CFA model to support the findings outlined here before the scale can be widely used for research purposes.

AUTHOR CONTRIBUTIONS

Conceptualization, L.d.L.-L., S.A.G., and E.M.W.; methodology, L.d.L.-L.,S.A.G., and E.M.W.; software, L.d.L.-L., and E.M.W.; formal analysis, L.d.L.-L., and E.M.W.; investigation, L.d.L.-L.; resources, L.d.L.-L.; data curation, L.d.L.-L., and E.M.W.; writing—original draft preparation, L.d.L.-L., S.A.G., and E.M.W.; writing—review and editing, L.d.L.-L., S.A.G., and E.M.W.; visualization, S.A.G., and E.M.W.; supervision, S.A.G., and E.M.W.; project administration, L.d.L.-L. All authors have read and agreed to the published version of the manuscript.

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No potential conflict of interest was reported by the authors.

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APPENDIX A. MENTAL STRENGTH SCALE – ORIGINAL VERSION

Thinking about your athletic and exercise engagement, mark the box that best represents your thoughts over the past month. There is no right or wrong answer, just answer it to the best of your ability!

Mark one box per row that best describes your thoughts		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
MSS 1	Challenges make me doubt myself (DRF)	5	4	3	2	1
MSS 2	I hate challenges (DRF)	5	4	3	2	1
MSS 3	I enjoy opportunities to challenge myself (FO)	1	2	3	4	5
MSS 4	I am scared of failing (DRF)	5	4	3	2	1
MSS 5	It's hard to recover from failure (DRF)	5	4	3	2	1
MSS 6	Challenges make me stronger (FO)	1	2	3	4	5
MSS 7	I have overcome challenges in the past (FO)	1	2	3	4	5
MSS 8	I don't like to get out of my comfort zone (DRF)	5	4	3	2	1
MSS 9	If it's hard, I may not finish it (DRF)	5	4	3	2	1
MSS 10	I work hard to overcome challenges (FO)	1	2	3	4	5

Note. FO = Facing Obstacles; DRF = Dealing with Risk of Failure.

APPENDIX B. SCALE MODIFICATIONS

Mental Strength Scale		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
O1	Dealing with failures makes me stronger. (DRF)	1	2	3	4	5
O2	I don't like to put myself in situations where I may not succeed. (DRF)	5	4	3	2	1
O3	I enjoy opportunities to challenge myself. (FO)	1	2	3	4	5
O4	Challenges make me doubt myself. (FO)	5	4	3	2	1
O5	When I don't succeed at something, I recover from failure quickly. (DRF)	1	2	3	4	5
O6	If I believe I can fail, I may not finish. (DRF)	5	4	3	2	1
O7	When I face obstacles, I work hard to overcome them. (FO)	1	2	3	4	5
O8	I have a hard time finding the motivation to overcome challenges. (FO)	5	4	3	2	1
N1	Instead of dwelling on failures, I focus on learning from them and making improvements. (DRF)	1	2	3	4	5
N2	I use setbacks as opportunities to grow and develop new skills. (DRF)	1	2	3	4	5
N3	I recover quickly from adversity. (DRF)	1	2	3	4	5
N4	I use setbacks as motivation to work harder and achieve my goals. (DRF)	1	2	3	4	5
N5	I have a strong capacity for bouncing back from adversity. (DRF)	1	2	3	4	5
N6	I am resilient and able to recover quickly from setbacks. (DRF)	1	2	3	4	5
N7	I am persistent in pursuing my goals, even when faced with obstacles. (FO)	1	2	3	4	5
N8	I tend to complete tasks regardless of how long they take. (FO)	1	2	3	4	5
N9	I am persistent in completing tasks, even when I lack motivation. (FO)	1	2	3	4	5
N10	I am able to overcome obstacles and continue working towards my objectives. (FO)	1	2	3	4	5
N11	I am determined to achieve my goals and will not give up easily. (FO)	1	2	3	4	5
N12	I am able to stick to tasks even when they become challenging or boring. (FO)	1	2	3	4	5

Note FO = Facing Obstacles; DRF = Dealing with Risk of Failure

APPENDIX C. MENTAL STRENGTH SCALE (MSS-9) – CHAMPIONED VERSION

Mark the box that best represents your behaviours over the past month.

Mental Strength Scale		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
MSS1	Instead of dwelling on failures, I focus on learning from them and making improvements.	1	2	3	4	5
MSS2	I recover quickly from adversity.	1	2	3	4	5
MSS3	I have a strong capacity for bouncing back from adversity.	1	2	3	4	5
MSS4	I am resilient and able to recover quickly from setbacks.	1	2	3	4	5
MSS5	I tend to complete tasks regardless of how long they take.	1	2	3	4	5
MSS6	I am persistent in completing tasks, even when I lack motivation.	1	2	3	4	5
MSS7	I am determined to achieve my goals and will not give up easily.	1	2	3	4	5
MSS8	When I don't succeed at something, I recover from failure quickly.	1	2	3	4	5
MSS9	When I face obstacles, I work hard to overcome them	1	2	3	4	5

