Title

Development of an occupational challenge assessment tool using Bayesian structural equation modeling

Short title

An occupational challenge assessment

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1 **Abstract**

2 **Purpose.** The purpose of this study was to develop an assessment tool specifically for
3 evaluating occupational challenge, and to test its validity and reliability.

4 **Methods.** Our prototype Occupational Challenge Assessment (OCA) was developed from the
5 relevant literature with inputs from an expert panel and was generated by assessing content
6 and face validity. This was tested by recruiting 103 hospitalized patients with physical
7 dysfunction. The final version of the OCA was developed by assessing item validity, item
8 response, construct validity, structural validity, hypothesis testing (convergent and
9 discriminant validity), concurrent validity, internal consistency reliability, and test–retest
10 validity using Bayesian structural equation modeling for categorical data.

11 **Results.** The final version of the OCA included 13 items and addressed both personal
12 challenge and environmental challenge. It had satisfactory validity and reliability.

13 **Discussion.** The OCA can be used to assess the state of occupational challenge for clients
14 with physical dysfunction. Furthermore, it may be able to properly quantify the occupational
15 challenge. Use of the OCA may assist occupational therapists with supporting the transition of
16 clients from hospitalization to community living.

17

1 **Introduction**

2 In a hospital setting, the rehabilitation process provides support to clients in moving
3 smoothly from hospitalization to community living (Saito et al., 2015). It is therefore
4 important that multidisciplinary care such as rehabilitation doctors, nurses, occupational
5 therapists, physical therapists, and speech therapists, support the client's recovery toward
6 achieving the aim of lifestyle redesign (Saito et al., 2015), with the role of the occupational
7 therapist being to promote the client's health and well-being through engaging in meaningful
8 activity in everyday life (WFOT, 2010).

9 The purpose of occupational therapy is to help the client change from a state of
10 occupational dysfunction to one of occupational adaptation (Kielhofner, 2007). Occupational
11 dysfunction is a state of a negative experience related to engaging in daily activities
12 (Kyougoku, 2010), whereas occupational adaptation is "state of competency in occupational
13 functioning toward which human being aspire." (Schkade & Schultz, 1992). To achieve
14 occupational adaptation, the client should attempt new or difficult occupations; in
15 occupational adaptation theory, this is referred to as "occupational challenge" (Schkade &
16 Schultz, 1992; Schultz & Schkade, 1992). Occupational challenge is the first stage in a
17 consistent process from occupational dysfunction to occupational adaptation (Shultz, 2009).
18 The underlying mechanism for constructing occupational challenge involves, on the one hand,
19 the client's personal desire for mastery over the occupation and his or her person systems for
20 achieving this, and, on the other hand, the demand for performance from the occupational
21 environment. If the demand for performance or challenge exceeds the client's capacity to
22 adapt, occupational dysfunction results. It is mean that the client would be unable to achieve
23 the occupational challenge.

24 Studies on occupational challenge have addressed a variety of areas, such as
25 psychiatric disability, physical disability, caregivers, older workers, and fieldwork students
26 (Coates & Crist, 2004; Moyers & Coleman, 2004; Lopez, 2011; Williams & Murray, 2013;
27 McDougall, Buchanan & Peterson, 2014). These studies have suggested that occupational
28 challenge was effective in clients who desired engagement in meaningful occupation. It was
29 also reported that a benefit of using occupational challenge evaluation and intervention was

1 improvement in the effectiveness of occupational therapy in a cost containment environment;
2 that is, for clients who experienced some failure, occupational challenge was necessary in
3 order to engage in occupation in such an environment (Dale et al., 2002).

4 Occupational therapists therefore need to assess occupational challenges in the
5 hospital setting. Several instruments have been used for evaluations related to occupational
6 challenge, including the Self-completed Occupational Performance Index (Imai & Saito,
7 2010), the Scale for Achievement Motive in Rehabilitation (Sano, Kyougoku & Yabuwaki,
8 2014), Classification and Assessment of Occupational Dysfunction (Teraoka et al., 2013),
9 Occupational Self-Assessment (Ishii & Yamada, 2008), the Model Of Human Occupation
10 Screening Tool (Parkinson, Forsyth & Kielhofner, 2007), and the Occupational Case Analysis
11 Interview and Rating Scale (Lai, Hagulund & Kielhofner, 1999). However, as yet no
12 assessment specifically focused on occupational challenge has been developed. The purpose
13 of this study was therefore to develop an occupational challenge assessment (OCA) and to
14 test its validity and reliability for participants with physical dysfunction in the recovery stage.

16 **Materials and Methods**

17 **Ethics statement**

18 The study was approved by the ethics committee of Kibi International University
19 (No. 14–34) and was conducted in accordance with the principles of the Declaration of
20 Helsinki. All participants gave their written and spoken informed consent. Participants were
21 told they could leave the study at any time without needing a particular reason. Survey sheets
22 were returned in anonymous, sealed envelopes.

24 **Design**

25 This study followed the standards established by the COnsensus-based Standards
26 for the selection of health Measurement INstruments (COSMIN) initiative (Tsuchiya, 2015).
27 The development process consisted of informed consent, development of a construct
28 framework and item pool, item reduction, and development of the assessment.

Development of the framework and item pool

The item pool for the OCA was generated through a multi-step process: (1) construction of a framework concept, (2) a review of relevant assessment instruments, and (3) convening an expert panel.

Occupational adaptation theory was used as the construct framework concept for developing the OCA. This framework concept was defined on the basis of a literature review by several of the researchers. As a result of this, we systematically identified personal and environmental challenges. Personal challenge was defined as a client's effort to accomplish an occupation in which he or she had an interest or a desire to achieve. Environmental challenge was defined as thinking of clients that want to accomplished effort to the expected occupation by around people.

To develop the item pool for the OCA, we initially gathered 55 items based on the framework, consisting of 28 items related to personal challenge and 27 items related to environmental challenge. Our intention was that the final version of the OCA would include about 10 items, and that items would be based on a 4-point Likert scale. Relevant assessments included the self-cognition scale, the self-efficacy scale, the achievement motivation scale, and the identity scale.

To assess the instrument's content and face validity, nine occupational therapy experts evaluated its item pool using the two steps of the consensus development method: Step 1, item pool review and item adjustment; and Step 2, re-review. In step 1, each of the 55 items in the pool was reviewed to assess its content and face validity, and rated on a 3-point Likert scale, with 1 being "not plausible," 2 "doubtful," and 3 "highly plausible." When the rating was 1 or 2, we requested the panelists to suggest additional examples, modifications to the wording, or deletions, as appropriate. Based on this, we revised the wording of the collected questions. In Step 2, the panelists re-reviewed the modified items. For inclusion in the prototype OCA, an item needed the agreement of seven of the nine expert panelists.

After completing these steps three times, we developed the 29-item prototype version of the OCA. This included 15 items related to personal challenge and 14 items related to environmental challenge. This was in accordance with occupational adaptation theory,

1 which assesses the state of occupational adaptation and the process leading toward
2 occupational adaptation (Schkade & Schultz, 1992). Each item in the prototype used a 4-point
3 Likert scale rated from 1 (strongly disagree) to 4 (strongly agree).

5 **Item reduction and development of the assessment**

6 ***Participants***

7 The participants recruited to this study were inpatients of the convalescent
8 rehabilitation system in the disability area. The convalescent rehabilitation system is a
9 hospitalization system developed in Japan, which supports patient in the recovery stage prior
10 to their transition to community living. The participants were able to comprehend sentences
11 and had suffered no reduction in their judgmental ability. Their cognitive function was
12 assessed using the Revised Hasegawa Dementia Scale or Mini-Mental State Examination, and
13 any participant scoring less than the cut-off value was excluded from the study. We obtained
14 relevant demographic data from the participants, including their age, sex, major diagnosis,
15 month in hospitalization, and secondary diagnosis.

17 ***Procedure***

18 We carried out description of the study to the participants, was consent.
19 And we were asked to reply to each questionnaire to participants. Then, during 4 weeks w weeks from
20 the beginning answer, and asked the implementation of the re-test (the 29-item prototype version of
21 the OCA only). Study period was about 7 months.

23 ***Questionnaires***

24 The Self-Completed Occupational Performance Index (SOPI) (Imai & Saito, 2010; Imai &
25 Saito, 2011) assesses leisure (3 items), productivity (3 items), and self-care (3 items). This
26 constructing factor was based on the Canadian Model of Occupational Performance, developed
27 by the Canadian Association of Occupational Therapists in 1997 to focus on occupational
28 performance (Polatajko, Townsebt & Craik, 2007). Each set of three items in SOPI assesses
29 “occupational control,” “occupational balance,” and “satisfaction with performance.” It uses a

5-point Likert scale rating from 1 (strongly disagree) to 5 (strongly agree). SOPI is a measure to evaluate state rather than ability and so the client's activities are not identified.

The Scale for Achievement Motive in Rehabilitation (SAMR) (Sano, Kyougoku & Yabuwaki, 2014; Sano & Kyougoku, 2015) is a self-completed measure to evaluate the state of motivation in rehabilitation, defined as the desire to accomplish a goal that is valuable to the client. SAMR six items related to self-mastery-derived achievement motive and four items related to means/process-oriented-derived achievement motive. Each item uses a 7-point Likert scale rating from 1 (strongly disagree) to 7 (strongly agree). Self-mastery-derived-achievement motive is defined as the desire based on purposive behavior to accomplish a goal, accompanied by growth and achievement. Means/process-oriented-derived achievement motive is defined as the willingness to place importance on the process and method for achieve the goal on rehabilitation.

Statistical analysis

We analyzed sample characteristics, item validity, hypothesis testing (convergent and discriminant validity), concurrent validity, internal consistency reliability, and test-retest validity. We also evaluated the construct validity, structural validity, and item responses using Bayesian structural equation modeling (BSEM) for categorical data. BSEM is a way of detecting non-invariance in a similar manner to modification indices with maximum-likelihood estimation. Bayesian analysis was chosen as it allowed performance from a small sample without the need for large-sample theory (Muthen & Asparouhov, 2010).

All items of the prototype of the OCA were assessed using polyserial correlation coefficients, with a coefficient value >0.2 taken as the standard indication of an item's validity (Tyoda, 2002).

The statistical models used in our analyses were based on graded item response theory using Bayesian estimation. Item response theory methods were used to estimate item slope and item difficulty parameters for the OCA items. In the Bayesian analysis, the model used Markov chain Monte Carlo (MCMC) sampling algorithms to obtain approximations to the posterior distributions. Convergence was tested using the Gelman–Rubin potential scale

reduction factor; the monitored Rhat should be 1.1 or less. The data sets were three MCMC chains each with a simulation size of 10,000 after a burn-in period of 5000 iterations. Model fit was evaluated using posterior predictive p-values, the associated 95% confidence interval, and the number of iterations needed for convergence. A good posterior predictive p-value is around 0.5, and the 95% confidence interval should not include 0 (Kosugi & Shimizu, 2014). This configuration was similarly applied to the other analysis that exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).

Construct validity was tested by determining the factor structure of the 29-item prototype OCA using EFA with Bayesian estimation and oblimin rotation (Kosugi & Shimizu, 2014). Items not loading on a factor (factor loading <0.3) or loading on more than one factor were deleted from the scale. The analysis then proceeded with the reduced item set.

To assess structural validity, we performed an EFA followed by a CFA using Bayesian estimation. Model fit was evaluated using posterior predictive p-values, the associated 95% confidence interval, and the number of iterations needed for convergence. When the value of the pass coefficient was less than 0.4, the model was modified.

For hypothesis testing, we calculated the squares of the correlations between personal challenge factor and environmental challenge factor. And we have calculated average variance extracted (AVE) of OCA. Convergent validity was assessed as the square root of every AVE value belonging to each latent construct, and was based on whether the AVE was greater than 0.5. Discriminant validity was assessed by comparing the squared correlation between each pair of constructs against the average of the AVE for the OCA factor structure (Kyougoku et al., 2015; Teraoka & Kyougoku, 2015).

Concurrent validity of the prototype OCA items and factors was assessed in the relationships between the SAMR and SOPI results using categorical correlation. Values of 0.2–0.4 were considered to indicate weak correlation, 0.4–0.7 a moderate correlation, and 0.7–0.9 a strong correlation.

Internal consistency reliability was checked using Cronbach's α and ω coefficients, and test–retest validity was assessed on the relationships between each item of 1st-test and 2nd-test by using categorical correlation. We selected items with correlation coefficients >0.4 .

Participant demographics and the scores for each scale were summarized using descriptive analysis. Means and standard deviations (SD) of the item scores were calculated, and item floor and ceiling effects were confirmed. Normality was examined using the Jarque–Bera test (with significance set at $p < 0.05$).

The statistical analyses were performed using HAD version 13 (<http://norimune.net/had>). Mplus version 7.2 (<http://www.statmodel.com>) was used for the construct validity, structural validity, and BSEM.

Results

A total 103 participants were recruited from eight hospitals. Table 1 presents their characteristics, mean cognitive assessment scores, and main diagnoses.

Table 2 presents the mean scores for all 29 items of the prototype OCA. All of the items satisfied the polyserial correlation coefficient standard (>0.2), indicating their validity.

The item slope parameters (α) and item difficulty parameters (β) for the 29 items of the prototype OCA satisfied the standard for the appropriate discrimination and difficulty indexes (Table 3). The model data fit with a posterior predictive p-value of 0.00. A value of Rhat of less than 1.1 was achieved according to the rotation of 3300 numbers.

For result that repeated an EFA for construct validity, two factors with 13 items were used (Table 4). Two factors were constructed with 8 items for factor 1 and 5 items for factor 2. The model data fit with a posterior predictive p-value of 0.40. A value of Rhat of less than 1.1 was achieved by rotating 4300 numbers. The CFA for structural validity was performed based on the EFA; the pass coefficient value was 0.4 or more (Fig. 1). The model data fit with a posterior predictive p-value of 0.43. A value of Rhat less than 1.1 was achieved by rotating 2200 numbers. Therefore, the CFA of the OCA was a good estimate of the model fit. The convergent and discriminant validity of the OCA was high (Table 5).

Correlation analysis showed weak and modest positive correlations between the 29 items of the prototype OCA and SAMR. With SOPI, weak positive correlations were found for only 8 of the 29 items, with no correlation observed in the remainder (Table 6).

After the item reduction process, 13 items remained in the OCA. The concurrent

1 validity of the OCA of 13 items was confirmed by the correlations between the OCA factor
2 scores and SAMR and SOPI. The OCA factor scores showed a weak positive correlation with
3 all factors on the SOPI, but environmental challenges on the OCA factor and the method of
4 internal achievement motivation on the SAMR had only a weak positive correlation (Table 7).
5 The internal consistency of the OCA (for the total score and all subscales) was in the
6 acceptable range, from 0.83 to 0.92 (Table 4). The OCA displayed modest to strong test–retest
7 reliability ($r = 0.45$ to 0.77 , $p < 0.01$) (Table 2).

8 9 **Discussion**

10 **Psychometric properties of the OCA**

11 We developed the OCA as a new, self-administered instrument for evaluating
12 occupational challenge in patients at the recovery stage, and validated its psychometric
13 properties. Several our results suggest that the validity and reliability of the OCA were
14 satisfactory. To the best of our knowledge, this is the first study on the development of an
15 assessment for occupational challenge.

16 The polyserial correlation coefficients exceeded 0.2, indicating that each item in the
17 OCA was able to measure the occupational challenge of a framework in the same way. This
18 was a result of having refined all of the items according to strict standards (with acceptance
19 requiring the agreement of at least seven of the nine panelists). For this reason, we consider
20 each of the OCA items to have been validated.

21 Item response theory was used to examine individual characteristics of the OCA
22 items. All item slope and difficulty parameters were confirmed as meeting the reference
23 values. The mean of the item slope parameter values was 1.33, suggesting that the OCA can
24 clearly distinguish states of occupational challenges of the participants. Because the difficulty
25 parameters tended to have negative values, the OCA items were suitable for clients who
26 would be unable to achieve the occupational challenge.

27 The construct and structural validity of the OCA were assessed using EFA and CFA,
28 which showed acceptable results for the final 13 OCA items in a two-factor structure. Overall,
29 the OCA showed a good model fit for the validity of the factors.

1 These three analyses were of importance for developing the OCA. Bayesian
2 analysis can be used to obtain appropriate results in small-sample data (Kosugi & Shimizu,
3 2014). We believe that using Bayesian estimation increased the measurement accuracy of
4 these three analyses because the sample size for this study was small, with only 103
5 participants.

6 Hypothesis testing of this study's results showed the convergent and discriminant
7 validity of OCA to be acceptable. As assessed by Cronbach's α and ω , internal consistency
8 reliability was acceptable for the 13 items of the two-factor structure.

9 The concurrent validity of the OCA was assessed by comparing it with SAMR and
10 SOPI. No concurrence was observed between the 29-item version of the OCA and the factors
11 of SOPI, perhaps because each assessment has a different concept level. OCA assesses the
12 process of challenging something, whereas SOPI assesses the situation of occupational
13 performance (Imai & Saito, 2010). In contrast, a weak to modest concurrence was observed
14 between the 29-item version of the OCA and the items of SAMR. SAMR assesses the client's
15 motivation to achieve a goal (Sano, Kyoungoku & Yabuwaki, 2014); that is to say it assesses
16 the client's feeling toward the challenge. The concurrence between OCA and SAMR was not
17 too high, showing that the OCA and SAMR were not identical in concept and assessed
18 different aspects; we therefore believe that developing the OCA was meaningful.

19 The test-retest validity of all the OCA items was good, with moderate correlations
20 (Table 2). Overall the occupational challenge may change over a fixed time, the
21 reproducibility of the OCA in this study remained stable. As reason, we think that re-test long
22 a period of up to 4 weeks. Furthermore, the convalescent rehabilitation system is easy to
23 change to accommodate the challenges of clients in time (or location).

24 Several results of the analysis suggested that the OCA has validity, reliability and
25 utility in a clinical setting. The product in this study was able to develop a new concept
26 measure as OCA exactly and this measure is able to quantitative stable analysis.

27 28 **Practical implications**

29 There are some practical implications for developing the OCA. A valid and reliable

assessment is needed for designing and evaluating occupational challenge with management occupational therapy programs based on occupational adaptation theory. Occupational therapists can use the OCA to assess two perspectives of the occupational challenge of clients, namely the client's desire of mastery (personal challenge) and the demand to the client for mastery (environmental challenge).

The result of the item response theory analysis suggested that the OCA is a suitable measure for clients who would be unable to achieve the occupational challenge. That is to say, OCA is suitable for a client who changes from occupational dysfunction to occupational adaptation and needs the intervention. In the past, we have had no way to assess occupational challenge. Therefore, occupational therapists had possibility to different understanding of the occupational challenge. Now OCA has been developed, it is possible to understand the state of undergoing an occupational challenge from a client-centered perspective. In addition, the client, other therapists, the client's family, and team members such as occupational therapists can consider contributing to the generation of a common understanding of the work of occupational challenge.

Limitations

This study design had three limitations. First, there is the possibility that the characteristics of stroke were strongly reflected in the results because many of the participants had suffered a stroke. Second, there were only 103 participants, and so it is necessary to increase the number of participants. In this study, we compensated for the small number of participants by using Bayesian analysis. Finally, there is a need to handle variables as categorical data because a 4-point Likert scale rating was used in the OCA, requiring statistical software for handling categorical variables in the data analysis.

Conclusion

Overall, this study succeeded in developing an OCA consisting of two factors for patients in hospital. The OCA has satisfactory validity and reliability and is able to assess the state of the occupational challenge of lightening a client's burdens. We expect to expand this

1 into occupational therapy that promotes a transition from hospitalization to community living,
2 allowing occupational therapists to assess the occupational challenge concretely by OCA.

5 **Acknowledgments**

6 We thank cooperating the participants in this study. We gratefully acknowledge the
7 kind assistance of the staff members at Kibi International University and Kitahara
8 rehabilitation hospital.

10 **Author Contributions**

- 11 ● Narumi Morohoshi conceived and designed the experiments, performed the
12 experiments, analyzed the data, contributed reagents/materials/analysis tools, wrote
13 the paper, and prepared figures and/or tables.
- 14 ● Makoto kyougoku conceived and designed the experiments, analyzed the data,
15 contributed reagents/materials/analysis tools, wrote the paper, and reviewed drafts
16 of the paper.
- 17 ● Nobuyuki Sano conceived and designed the experiments, analyzed the data,
18 contributed reagents/materials/analysis tools.

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1 **Table 1** Participant Characteristics (n=103)

Sex	Number
Male	56
Female	47
Mean (SD)	69.10 (13.19)
Cognition assessments	Score
HDS-R: Mean (SD)	26.92 (2.56)
MMSE: Mean (SD)	27.80 (2.49)
Major diagnosis	Number
Stroke	76
Orthopedic	19
Neurology	4
Disuse syndrome	2
Unknown	2
Test–retest validity	Number
Implementation	75
Non-implementation	28

2 SD = standard deviation; HDS-R = Revised Hasegawa Dementia Scale; MMSE =
3 Mini-Mental State Examination

4

1 **Table 2** Descriptive statistics, and item validity

Item No.	Mean	SD	Floor or ceiling effect	PCC	Test–retest validity
1	3.42	0.83	Ceiling	0.57	0.65**
2	3.12	0.84	—	0.61	0.59**
3	3.33	0.75	Ceiling	0.61	0.77**
4	3.05	0.83	—	0.62	0.53**
5	3.37	0.76	Ceiling	0.63	0.57**
6	3.22	0.80	Ceiling	0.63	0.60**
7	3.20	0.80	—	0.69	0.62**
8	2.79	0.66	—	0.64	0.62**
9	3.31	0.83	Ceiling	0.71	0.45**
10	3.20	0.76	—	0.6	0.47**
11	3.00	0.82	—	0.72	0.39**
12	3.31	0.80	Ceiling	0.73	0.47**
13	2.84	0.81	—	0.74	0.56**
14	2.75	0.94	—	0.72	0.56**
15	3.39	0.72	Ceiling	0.73	0.59**
16	3.17	0.78	—	0.78	0.53**
17	3.24	0.73	—	0.71	0.64**
18	2.90	0.85	—	0.71	0.58**
19	3.03	0.87	—	0.73	0.73**
20	2.97	0.81	—	0.65	0.72**
21	2.81	0.89	—	0.75	0.71**
22	3.02	0.86	—	0.79	0.60**
23	2.62	0.89	—	0.69	0.65**
24	2.89	0.85	—	0.71	0.56**
25	3.31	0.73	Ceiling	0.78	0.58**
26	3.09	0.89	—	0.81	0.60**
27	3.22	0.84	Ceiling	0.7	0.49**
28	2.72	0.94	—	0.71	0.62**
29	3.00	0.93	—	0.69	0.69**

2 SD = Standard deviation; PCC = polyserial correlation coefficients; ** =

1 Significant at the 1% level

2

1 **Table 3** Item response theory results

No.	α (95% CI)	β 1 (95% CI)	β 2 (95% CI)	β 3 (95% CI)
1	0.71(0.41:1.06)	-2.83(-2.58:-1.53)	-1.85(-1.71:-0.97)	-0.36(-0.55:0.04)
2	0.90(0.58:1.27)	-2.31(-2.71:-1.53)	-1.20(-1.46:-0.72)	0.54(0.18:0.81)
3	1.08(0.72:1.49)	-2.57(-3.69:-2.04)	-1.51(-2.11:-1.19)	0.10(-0.23:0.45)
4	1.05(0.70:1.45)	-2.11(-2.78:-1.68)	-1.01(-1.46:-0.69)	0.26(0.31:1.03)
5	1.06(0.70:1.48)	-2.48(-3.35:-1.99)	-1.60(-2.20:-1.23)	0.00(-0.34:0.34)
6	1.00(0.65:1.38)	-2.71(-3.54:-2.01)	-1.20(-1.60:-0.83)	0.27(-0.05:0.60)
7	1.37(0.94:1.87)	-2.59(-4.77:-2.55)	-1.21(-2.20:-1.16)	0.42(0.20:0.99)
8	1.07(0.72:1.46)	-1.84(-2.52:-1.47)	-0.47(-0.85:-0.16)	1.05(0.75:1.52)
9	1.33(0.91:1.82)	-1.97(-3.36:-1.97)	-1.24(-2.19:-1.18)	0.05(-0.30:0.46)
10	1.02(0.67:1.42)	-2.38(-3.13:-1.84)	-1.44(-1.92:-1.06)	0.47(0.15:0.82)
11	1.43(0.99:1.94)	-1.77(-3.29:-1.90)	-0.84(-1.69:-0.76)	0.67(0.55:1.42)
12	1.62(1.13:2.21)	-1.87(-3.87:-2.29)	-1.16(-2.50:-1.32)	0.06(-0.33:0.55)
13	1.35(0.95:1.82)	-1.82(-3.15:-1.84)	-0.56(-1.17:-0.35)	0.93(0.85:1.71)
14	1.42(1.00:1.92)	-1.28(-2.34:-1.34)	-0.39(-0.98:-0.16)	0.85(0.78:1.69)
15	1.60(1.09:2.18)	-2.60(-5.78:-2.88)	-1.35(-2.88:-1.54)	0.02(-0.39:0.45)
16	1.88(1.33:2.54)	-1.97(-4.98:-2.65)	-0.95(-2.42:-1.20)	0.34(0.18:1.14)
17	1.37(0.95:1.88)	-2.69(-5.04:-2.65)	-1.19(-2.20:-1.15)	0.30(0.03:0.80)
18	1.24(0.85:1.69)	-1.73(-2.78:-1.58)	-0.71(-1.28:-0.49)	0.84(0.65:1.45)
19	1.37(0.95:1.86)	-1.72(-3.05:-1.77)	-0.81(-1.57:-0.69)	0.54(0.35:1.16)
20	1.04(0.69:1.43)	-3.05(-4.27:-2.24)	-0.63(-1.01:-0.32)	0.71(0.40:1.10)
21	1.53(1.08:2.06)	-1.56(-3.07:-1.77)	-0.34(-0.96:-0.10)	0.75(0.71:1.64)
22	1.79(1.28:2.43)	-1.68(-3.95:-2.21)	-0.66(-1.74:-0.68)	0.48(0.41:1.38)
23	1.26(0.87:1.70)	-1.36(-2.23:-1.25)	-0.24(-0.68:0.07)	1.16(1.02:1.94)
24	1.38(0.97:1.86)	-1.65(-2.96:-1.69)	-0.60(-1.26:-0.43)	0.78(0.66:1.53)
25	1.84(1.27:2.53)	-2.00(-4.96:-2.63)	-1.41(-3.44:-1.86)	0.20(-0.08:0.86)
26	2.18(1.56:2.94)	-1.54(-4.45:-2.45)	-0.64(-2.05:-0.82)	0.31(0.15:1.23)
27	1.13(0.76:1.55)	-2.02(-2.93:-1.72)	-1.29(-1.94:-1.04)	0.28(-0.04:0.67)
28	1.27(0.88:1.72)	-1.31(-2.16:-1.21)	-0.37(-0.86:-0.09)	0.93(0.78:1.63)
29	1.32(0.92:1.79)	-1.60(-2.71:-1.58)	-0.66(-1.30:-0.48)	0.45(0.22:0.99)

2 α = Item slope parameter; β = Item difficulty parameter; 95% CI = 95%

3 confidence interval

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Table 4 Construct validity and internal consistency reliability of the Occupational Challenge Assessment

OCA 13 Items $\alpha = 0.92$				
No.	Factor 1	Factor 2	UF	Item contents
Factor 1 Personal challenge $\alpha = 0.91$				
1	0.46*	0.13	0.67	I have a big goal I want to achieve.
5	0.85*	-0.1	0.34	I'm trying a change the current status.
12	0.88*	0.00	0.22	I want to effort to obtain for better results in everything.
14	0.67*	0.24	0.28	I'm working on something complex and difficult.
19	0.75*	0.08	0.35	I'm trying to improve my ability.
22	0.92*	-0.02	0.18	I want to try even if it is difficult things.
26	0.83*	0.13	0.14	I want to do my best and don't regret making an effort for my desire.
27	0.60*	0.23	0.41	I think it is fun to be able to overcome difficulties and failures for my desire.
Factor 2 Environmental challenge $\alpha = 0.83$				
6	0.08	0.68*	0.46	It is fun to meet the expectations of people around me.
7	0.11	0.75*	0.3	It is possible to work while helping each other with everyone even if it can be difficult.
8	-0.06	0.91*	0.24	I act in ways that are socially expected.
20	0.28	0.49*	0.49	I want to do my best to please others.
21	0.22	0.61*	0.4	I can work hard enough to expect to achieve higher goals from around people.
Factor correlation				
Factor 1	1.00			
Factor 2	0.62*	1.00		

UF = Unique Factor; * = Significant at the 5% level

1 **Table 5** Hypothesis testing for the Occupational Challenge Assessment

Factor	Convergent validity ($AVE \geq 0.5$)	Discriminant validity (Factor correlation/2 < AVE)
Factor 1	$0.65 \leq 0.5$	$0.55 < 0.65$
Factor 2	$0.59 \leq 0.5$	$0.55 < 0.59$

2 AVE = Average Variance Extracted

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1 **Table 6** Concurrent validity of the Occupational Challenge Assessment

No.	SOPI				SAMR		
	Total	Leisure	Productivity	Self-care	Total	Self	Method
1	0.29**	0.28*	0.31**	0.19	0.35**	0.36**	0.25*
2	0.19	0.28*	0.19	0.03	0.54**	0.50**	0.45**
3	0.42**	0.33**	0.41**	0.36**	0.49**	0.55**	0.29**
4	0.27**	0.35**	0.21 ⁺	0.17	0.39**	0.40**	0.28**
5	0.31**	0.16	0.35**	0.25*	0.55**	0.51**	0.47**
6	0.23*	0.20 ⁺	0.29*	0.17	0.28**	0.30**	0.19*
7	0.31**	0.28*	0.22 ⁺	0.30**	0.35**	0.43**	0.15
8	0.23*	0.16	0.25*	0.22*	0.32**	0.36**	0.19*
9	0.34**	0.23 ⁺	0.28*	0.40**	0.46**	0.51**	0.25**
10	0.26*	0.30**	0.25*	0.15	0.46**	0.48**	0.32**
11	0.18 ⁺	0.19 ⁺	0.19	0.12	0.53**	0.58**	0.33**
12	0.44**	0.33**	0.46**	0.36**	0.59**	0.61**	0.41**
13	0.14	0.11	0.20 ⁺	0.10	0.36**	0.37**	0.26**
14	0.31**	0.34**	0.36**	0.20 ⁺	0.51**	0.48**	0.44**
15	0.18	0.18	0.13	0.15	0.58**	0.57**	0.45**
16	0.23*	0.17	0.18	0.20 ⁺	0.56**	0.61**	0.35**
17	0.13	0.17	0.13	0.03	0.54**	0.55**	0.39**
18	0.01	0.00	0.07	−0.03	0.40**	0.40**	0.31**
19	0.19 ⁺	0.21 ⁺	0.21 ⁺	0.08	0.47**	0.47**	0.37**
20	0.19 ⁺	0.18 ⁺	0.18	0.16	0.49**	0.46**	0.42**
21	0.18 ⁺	0.21*	0.20 ⁺	0.05	0.51**	0.52**	0.37**
22	0.35**	0.40**	0.34**	0.19	0.61**	0.58**	0.50**
23	0.28**	0.31**	0.36**	0.09	0.56**	0.58**	0.40**
24	0.17 ⁺	0.08	0.24*	0.15	0.47**	0.48**	0.33**
25	0.46**	0.40**	0.46**	0.33**	0.68**	0.68**	0.51**
26	0.45**	0.41**	0.39**	0.36**	0.65**	0.66**	0.46**
27	0.10	0.10	0.10	0.04	0.45**	0.53**	0.21 ⁺
28	0.29**	0.31**	0.34**	0.11	0.45**	0.49**	0.27**
29	0.07	0.08	0.09	0.04	0.45**	0.47**	0.31**

1 SOPI = Self-Completed Occupational Performance Index; SAMR = Scale for
2 Achievement Motive in Rehabilitation; ** = Significant at the 1% level; * =
3 Significant at the 5% level; + = Significant at the 10% level
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1 **Table 7** Inter-factor correlation

	OCA total	Personal Challenge	Environmental Challenge
SOPI total	0.35 ^{**}	0.35 ^{**}	0.26 ^{**}
Leisure	0.33 ^{**}	0.34 ^{**}	0.25 ^{**}
Productivity	0.40 ^{**}	0.42 ^{**}	0.27 ^{**}
Self-care	0.26 ^{**}	0.26 ^{**}	0.19 ⁺
SAMR total	0.61 ^{**}	0.61 ^{**}	0.47 ^{**}
Self-mastery-derived	0.62 ^{**}	0.61 ^{**}	0.49 ^{**}
Means/process-oriented-derived	0.45 ^{**}	0.46 ^{**}	0.33 ^{**}

2 OCA = Occupational Challenge Assessment; SOPI = Self-Completed Occupational
 3 Performance Index; SAMR = Scale for Achievement Motive in
 4 Rehabilitation; ** = Significant at 1%; level + = Significant at 10% level

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1 Figure 1 Structural validity of the Occupational Challenge Assessment

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