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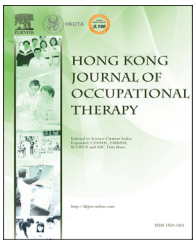

ORIGINAL ARTICLE

# Examining the Psychometric Properties of the Model of Human Occupation Screening Tool—Japanese Version

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**KEYWORDS**
Model of Human Occupation;
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**Summary** *Objective/Background:* The Model of Human Occupation Screening Tool-Japanese version (J-MOHOST) was developed, and it was identified that the J-MOHOST did not have any problems in linguistic validation. The purpose of this study is to examine the psychometric properties of the J-MOHOST for the physical disabilities.
*Methods:* Forty-four participants were recruited from the rehabilitative wards and data, including demographic variables and the J-MOHOST scores, were obtained. The fit statistics, rating scale characteristics, and reliability index were examined using the Rasch analysis.
*Results:* There were no misfitting participants, and the J-MOHOST measures reliably separated the participants into 3.95 statistically distinct strata with a person reliability of .88. The result of item fit showed that it did not have noticeable problem in the items of the J-MOHOST. Moreover, the item reliability was .88. The content of the item difficulty could represent the characteristics of occupational participation of the participants in conformity with the rating system of the J-MOHOST.
*Conclusion:* The J-MOHOST rating scale could discriminate the level of occupational participation in physical disabilities. The results indicate that the J-MOHOST is an effective tool for measurement. Further studies are needed to increase the number of participants with a variety of disabilities and settings.


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## Introduction

In Japan, the effect of rehabilitation for physical disabilities is often identified by the change in the Activities of Daily Living (ADL) indexes from admission to discharge. The most popular tools used to measure the level of ADL include Functional Independence Measure, Barthel Index, and Nishimura's scale for rating of activities of daily living of the elderly (N-ADL). Therefore, ADL training is emphasized in the rehabilitation settings (Watanabe, 2009). However, from an occupational therapy perspective, it was proposed that evaluating and intervening to support clients' engagement in meaningful occupations was critical (Fujimoto & Yamada, 2009). Further, the assessment and intervention focused on meaningful occupation is more effective for improving ADL (Shinohara, Yamada, Kobayashi, & Forsyth, 2012). The engagement in personally and socially meaningful occupations is conceptualized as occupational participation (Kielhofner, 2008).

To assess strengths and limitations in occupational participation of the clients, the Model of Human Occupation Screening Tool (MOHOST) was developed (Parkinson, Forsyth, & Kielhofner, 2006). The MOHOST is based on the Model of Human Occupation (MOHO), which is one of the most frequently used occupational therapy conceptual models of practice (Lee, Taylor, Kielhofner, & Fisher, 2008). Moreover, the model has been applied and empirically tested within various cultures (Lee et al., 2008).

The MOHOST measures relevant MOHO concepts, and each of the concepts has four items: (a) volition or motivation for occupations (appraisal of ability, expectation of success, interest, and choices), (b) habituation or pattern of occupation (routine, adaptability, roles, and responsibility), (c) communication and interaction skills (nonverbal skills, conversation, vocal expression, and relationships), (d) process skills (knowledge, timing, organisation, and problem-solving), (e) motor skills (posture and mobility, co-ordination, strength and effort, and energy), and (f) environment (physical space, physical resources, social groups, and occupational demands; Parkinson et al., 2006). Each of the 24 items is rated using a 4-point rating scale: F = facilitates occupational participation, A = allows occupational participation, I = inhibits occupational participation, and R = restricts occupational participation (Parkinson et al., 2006).

The MOHOST has multiple data collection methods such as client observation and interviews with a client, ward staff, and relatives. Moreover, its language has been adapted to facilitate communication among wider, multidisciplinary teams of professionals (Parkinson et al., 2006). As such, it can be used in the evaluation of a wide range of clients with psychosocial and/or physical disabilities, by occupational therapists in their interactions with other professionals while sharing information about their clients within rehabilitation teams. The MOHOST also helps occupational therapists to develop intervention plans at an early stage of rehabilitation. These characteristics of the MOHOST offer a cost-effective intervention (Hawes & Houlder, 2010) and prove useful with clients who are not able to self-report (Yabuwaki, Kobayashi, & Yasuda, 2013).

There are four international psychometric studies that examined the measurement properties of the MOHOST as follows. The first study on 166 participants employed confirmatory factor analysis, which showed that there were six underlying factors for each MOHO dimension (Kielhofner et al., 2009). The second study on 54 clients in an inpatient rehabilitation unit indicated that the MOHOST could detect change in clients from admission to discharge (Kramer, Kielhofner, Lee, Ashpole, & Castle, 2009). The third study on 101 clients provided evidence of internal consistency, construct validity, and inter-rater reliability (Pan et al., 2011). The latest study of 1039 adult psychiatric service users showed good construct validity, concurrent validity, and separation reliability, which indicated the reproducibility of person ability and item difficulty (Kielhofner et al., 2010).

As the MOHOST was primarily developed for use in the mental health settings, all participants in the above studies had psychiatric disabilities. However, in Japan, there were five case studies that discussed the application of the MOHOST in the rehabilitation settings for physical disabilities (Asano & Ishii, 2010; Hasegawa & Yamada, 2011; Irobe, Shinohara, & Yamada, 2011; Hayakawa, Minami, Kawatsu, Notoh, & Yamada, 2011; Yabuwaki et al., 2013). These studies reported that the MOHOST was a useful tool to identify challenges in occupational participation for clients with physical disabilities. However, to date, the psychometric properties of the MOHOST for the physical disabilities in Japan have not been examined. Therefore, the purpose of this study is to examine the psychometric properties of the MOHOST in the rehabilitation settings for physical disabilities in Japan.

## Methods

### Participants

This study applied Rash Analysis as a method of statistical analysis. The number of participants for the analysis is assumed to be $\geq$30, and this analysis does not require random sampling (Bond & Fox, 2007). In this study, over 30 participants were recruited voluntarily from rehabilitative settings for physical disabilities of two research hospitals using convenience sampling. The exclusion criteria included the existing diagnosis of dementia and/or higher brain dysfunction. The demographic characteristics of the participants are presented in Table 1. The study protocol was positively reviewed by the Research Ethics Committee of the Arakawa Campus, Tokyo Metropolitan University (No. 09080).

### The Japanese version of MOHOST

In order to develop the Japanese version of the MOHOST (J-MOHOST) and to examine its applicability in the context of physical rehabilitation, the criteria and rating scale of the MOHOST were translated into Japanese. This was followed by a back translation, which was performed independently by two occupational therapists with a deep

**Table 1** Demographic Characteristics of the Participants ($n = 44$).

| | |
|---|---|
| Age (y) | |
| Mean (SD) | 80.7 (8.03) |
| Range | 65–96 |
| Sex (*n*) | |
| Male | 7 |
| Female | 37 |
| ADL (N-ADL)[a] | |
| Median | 36 |
| Range | 19–50 |
| Diagnosis | |
| Fracture of femur | 27 |
| Vertebral compression fracture | 4 |
| Other fractures | 4 |
| Cerebrovascular disease | 6 |
| Spinal cord injury | 1 |
| Disuse atrophy | 2 |
| Period from onset (months) | |
| Mean (SD) | 1.8 (1.5) |
| Range | 1–8 |

N-ADL = Nishimura's scale for rating of activities of daily living of the elderly; SD = standard deviation.
[a] N-ADL is an observed assessment for the activities of daily living of the elderly, and ranges from 0 to 50 points.

understanding of the MOHO, and expertise in using the model in clinical practice. A pilot study was conducted with five people with physical disabilities. This study supported the linguistic validity of the J-MOHOST (Notoh, Yamada, Kobayashi, & Kobayashi, 2009). Following the pilot study, J-MOHOST was subjected to further revisions.

Similar to the original MOHOST, each of the J-MOHOST items is rated using a 4-point rating scale: F = 4, A = 3, I = 2, and R = 1. The rating is based on the information gathered from the observation of each participant within their occupational settings, an interview, and the reports from the rehabilitation team.

### Data collection

The first author who was familiar with the MOHO and with the protocol of the MOHOST, together with one of the translators of the MOHOST Japanese manual, rated the J-MOHOST following the observation and the interview. This was based on 40-60-minute-long occupational therapy assessment sessions with each participant. Participants' demographic characteristics were gathered from occupational therapists in charge of the participants' rehabilitation.

### Data analysis

The Rasch analysis was used to examine the data as it can calculate the relationship between people's ability relative to item difficulty. This is done while simultaneously converting an ordinal scale into a unidimensional interval scale (Bond & Fox, 2007). The Rasch analysis was performed using FACETS 3.67.1 (Linacre, 2010).

### Fit statistics and the standardized error

The fit statistics of the Rasch analysis indicate whether or not the items are unidimensional. Infit mean square residual (InMnSq) and standardized as a z score (Zstd) are indexes of fit statistics (Wright and Stone, 1979). The range of fit statistics is different according to the characters of the tests. In the clinical assessment, InMnSq $>$ 1.7 associated with Zstd $>$ 2.0 indicates a misfit, that is, an issue with the internal consistency of test items, the ability pattern of participants, or the measurement pattern (Bond & Fox, 2007). It is assumed that the reliable measurement is performed in the presumption of the person ability and item difficulty as the standardized error of each item is $\leq$0.30 logits (Tham, Bernspång & Fisher, 1999).

### Rating scale and item characteristics

The category probability curve, the item characteristic curve, and the item information curve are obtained according to the Rasch analysis. The category probability curve is the probability of responding to any particular category, given the difference in estimates between any person ability and any item difficulty. Item characteristic curve represents the relationship between the odds of success and the person ability and the item difficulty difference. Moreover, the item information curve shows the sensitivity of the amount of information that discriminates person ability (Bond & Fox, 2007).

### Person separation and the Rasch reliability

Rasch analysis also provides two indexes of how the J-MOHOST discriminates the clients into levels of occupational participation. These indexes are the person reliability and the item reliability. The person reliability represents the replicability of person ordering being given the same construct test items (Bond & Fox, 2007). The person reliability is estimated using the person separation index, which is calculated as 4 [separation index] + 1/3. The person separation index indicates the statistically distinguishable levels of the construct that is represented by the items (Wright, 1996). Item reliability is equivalent to the test reliability of internal consistency of the classical test theory. The values of both reliabilities are required to be $>$.8 (Linacre, 1997).

## Results

### Fit statistics and the standardized error

The average of the person ability measures was 1.41 logits (standard deviation [SD] = .33 logits), and the range was from -0.22 logits to 4.09 logits. The average of the standardized error was 0.33 logits (SD = .88 logits), and the range was from 0.27 logits to 0.68 logits. Twenty-one participants showed their standardized error was $>$0.3 logits. The average InMnSq of the person difficulty measure was 0.65 logits (SD = .30 logits), and Zstd was −1.4 logits (SD = 1.30 logits). Table 2 shows the results of the Rasch

**Table 2** Item Fit Statistics for the 24 Items of the MOHOST-J.

| Items | Item difficulty measures | Standardized error | InMnSq | Zstd | The hierarchical order of item difficulty |
|---|---|---|---|---|---|
| Motivation for occupations | | | | | |
| Appraisal of ability | 0.52 | 0.22 | 0.65 | −1.90 | 5 |
| Expectation of success | 0.37 | 0.22 | 0.50 | −2.90 | 7 |
| Interest | 0.66 | 0.21 | 0.52 | −2.80 | 3 |
| Choice | 0.63 | 0.21 | 0.62 | −2.10 | 4 |
| Pattern of occupation | | | | | |
| Routine | 0.29 | 0.22 | 0.49 | −2.90 | 9 |
| Adaptability | 0.03 | 0.23 | 0.35 | −4.00 | 12 |
| Responsibility | 0.33 | 0.22 | 0.61 | −2.10 | 8 |
| Roles | 0.48 | 0.22 | 0.41 | −3.60 | 6 |
| Communication and interaction skills | | | | | |
| Nonverbal skills | −0.64 | 0.26 | 0.78 | −0.90 | 19 |
| Conversation | −0.71 | 0.26 | 0.70 | −1.30 | 21 |
| Vocal expression | −0.64 | 0.26 | 0.92 | −0.20 | 20 |
| Relationships | −0.57 | 0.25 | 0.50 | −2.60 | 18 |
| Process skills | | | | | |
| Knowledge | −0.22 | 0.24 | 0.63 | −1.90 | 16 |
| Timing | −0.27 | 0.24 | 0.43 | −3.20 | 17 |
| Organisation | −0.16 | 0.24 | 0.45 | −3.10 | 15 |
| Problem-solving | 0.08 | 0.23 | 0.53 | −2.60 | 11 |
| Motor skills | | | | | |
| Posture and mobility | 1.93 | 0.21 | 1.21 | 1.00 | 1 |
| Co-ordination | 0.84 | 0.21 | 0.60 | −2.30 | 2 |
| Strength and effort | 0.29 | 0.22 | 0.90 | −0.40 | 10 |
| Energy | −0.02 | 0.23 | 0.87 | −0.50 | 13 |
| Environment | | | | | |
| Physical space | −0.79 | 0.27 | 0.87 | −0.50 | 22 |
| Physical resources | −1.05 | 0.28 | 0.80 | −0.80 | 23 |
| Social groups | −1.26 | 0.30 | 0.65 | −1.50 | 24 |
| Occupational demands | −0.11 | 0.24 | 1.05 | 0.30 | 14 |

MOHOST-J = The Model of Human Occupation Screening Tool Japanese version; lnMnSq = lnfit mean square residual; Zstd = standardized as a z score.

analysis of the item difficulty measure, the standardized error, InMnSq, Zstd, and the hierarchical order of item difficulty of the J-MOHOST. The average item difficulty measure was 0.00 logits (SD = .68 logits), and the range was from -1.26 logits to 1.93 logits. The item difficulty measure of "posture and mobility" was significantly higher than the other items for the participants. The average standardized error was 0.24 logits (SD = .22 logits), and the range was from 0.21 logits to 0.30 logits. No item showed a standardized error above 0.3 logits. The average lnMnSq of the item difficulty measure was 0.67 logits (SD = .21 logits), and Zstd was -1.80 logits (SD = 1.30 logits). In terms of the hierarchical order of item difficulty, the items of "posture and mobility" and "co-ordination" in the area of "motor skills", and the items in the area of "motivation for occupations", were harder than other items for the participants. Comparatively, the items in the area of "communication and interaction skills", "process skills", and "environment" were easier than other items.

The results of the fit statistics and the standardized error showed that there were no misfitting participants and items, although the ability of the participants was relatively higher than the item difficulty. The number of the standardized error indicators for person ability was >0.3 logits. The results indicate a reliable measurement of items difficulty, but not of person ability.

## Rating scale and item characteristics

According to the results of the category probability curve, the item characteristic curve, and the item information curve of the J-MOHOST, the item difficulty measure changed "R" into "I" at -1.47 logits, "I" into "A" at −0.18 logits, and "A" into "F" at 1.65 logits. These results show that the rating category of the J-MOHOST was along the order of the 4-point scale. The observed counts of each 4-point rating scale indicated that the "R" was 20 (2%), "I" was 123 (12%), "A" was 406 (38%), and "F" was 507 (48%). This result indicates that the ability level of the participants was relatively high. The items within the range of almost −1.0—0 logits, which were in the area of

"communication and interaction skills", "process skills," and "environment", showed a high amount of information.

### Person separation and the Rasch reliability

The person reliability was .88, and the person separation index was 2.71, which results in 3.95 different levels of occupational participation. The item reliability was .88. This indicates the required level of reliability.

## Discussion

The results of this study showed that there were no misfitting people and that there were items with good estimations of reliability. Moreover, the content of item difficulty measure represented the characteristics of occupational participation of the clients who had physical disabilities.

The results showed that the person ability measures were relatively higher than item difficulty measures. The average standardized error of person ability was 0.33 logits, though there were no misfitting participants. This result was related to the characteristics of the participants. Typically, clients are admitted to the rehabilitative wards within 1 month after receiving acute care (Watanabe, 2009), and within this time frame ADL improves markedly. The participants of this study, however, were 1.8 months from onset and had a N-ADL score median of 36 points (out of a possible 50 points), which indicated requirement for some assistance in ADL (Kobayashi et al., 1988). Additionally, the range of N-ADL indicates a wide range of variance of participants' ADL ability. These factors were responsible for the low reliability of the measurement of person ability. The majority of the participants had a diagnosis of a "fracture". Consequently, the most difficult items were "posture and mobility" and "co-ordination" of "motor skills". It is anticipated that the stable environment should facilitate occupational participation (Kielhofner, 2008). All the participants were within hospital wards (from acute to rehabilitation) and it could be argued that their "appraisal of ability" in their new environment was still developing, and that their "choices" were interrelated with the new environment as they attempted to put plans into action (Parkinson et al., 2006). Moreover, functioning within a hospital environment made the development of "interests" difficult. This indicates a need for occupational therapists to focus therapy on developing "motivation for occupations" alongside "motor skills" as a priority, given its level of difficulty for clients. The items of "environment" were the easiest, which is consistent with being within a supportive hospital ward environment. "Communication and interaction skills" were also indicated as easy items as the participants were not experiencing impairments in this area. The discrimination among the items difficulties caused the problem in the standardized error of person ability. However, the items of the J-MOHOST could distinguish clients into 3.95 statistically distinct strata with a person reliability that was .88, and there was no misfitting of person ability measure. This allows occupational therapists to discriminate clients' abilities into many different levels of occupational participation. Moreover, the standardized error of all items of the J-MOHOST in this study was between 0.21 logits and 0.30 logits, which is indicative of a reliable measurement. The result of the item reliability was .88. There was also no misfitting item. The results indicated no issues with the reliability of replicability of person ordering, or with internal consistency of the J-MOHOST items, including the results of the standardized error of the person ability.

It could be argued that the items of "communication and interaction skills", "process skills", and "environment" (those measures were in the range of −1.0—0 logits) contributed to the distinction of participants' abilities from the item information curve in this study. In occupational therapy practice, clinicians often intervene for "communications and the interaction skills" and "process skills" through the adaptation of the "environment" (Forsyth, Lai, & Kielhofner, 1999) when the physical disability is significant. Indeed, some case studies have illustrated that occupational participation has increased through skill based interventions (Asano & Ishii, 2010; Hasegawa & Yamada, 2011; Irobe et al., 2011; Hayakawa et al., 2011). From this clinical point of view, the items within areas of "communication and interaction skills", "process skills", and "environment" are indicative of clients' increased need for occupational therapy services. The result of the items information curve was expected clinically. Moreover, the result that the expected score was in order of the 4-point scale of the J-MOHOST reflected the item difficulty and indicated the tools' ability to assess clients according to their occupational participation.

It is ideal to develop a rating scale that generates the average of person ability measure as 0.0 logits (Kobayashi, Yamada, Kawamata, Ishibashi, & Ishii, 2010). When the 4-point J-MOHOST rating scale divides into two, that is, occupational participation strengths ("F" and "A") and occupational participation difficulties ("I" and "R"), the category probability of "A" and "I" changes at −0.18 logits. The J-MOHOST rating scale was, therefore, able to distinguish the difficulty of occupational participation of the participants close to 0.0 logits. Moreover, it was thought that the rating scale was adapted to the clients who had various ranges of the abilities as the ability measure was widely distributed within the range of −3.0—3.0 from the findings in the category probability curve and the item characteristic curve. It was suggested that the 4-point scale of the J-MOHOST as ordinal was able to discriminate among the clients' problems of ability of occupational participation for clinical use.

There are limitations to this study. The representation of occupational participation of general clients with physical disabilities was not sufficiently reflected in the results as this study had a limited number of participants, though the minimum requirement for the Rasch analysis was met. Additionally, many of the participants in this study experienced orthopaedic diseases. This increased items' difficulty on the subscale of "motor skills" of the J-MOHOST. This sampling bias influenced the reliable measurement of person ability. A future study should examine the validity of the items of the J-MOHOST with increasing participants who are of different rehabilitation settings and of different disabilities. Additionally, in this study, the first author rated the J-MOHOST as it had not yet percolated through to every

settings of occupational therapy in Japan. The fit statistics of raters should be examined in a future study.

## Conclusion

This study examined the psychometric properties of the J-MOHOST for the clients who had physical disability, within rehabilitative wards. Data, including demographic variables and scores on the J-MOHOST were retrieved from 44 clients. The Rasch analysis was used to examine the observed consistencies in test responses, the fidelity of the scoring structure, and the reliability. There were no misfitting participants, and the J-MOHOST measures reliably separated the participants into 3.95 statistically distinct strata with the person reliability of .88 in conformity with the rating system of the J-MOHOST. Moreover, the fit index of the items did not indicate noticeable problems, and the item reliability was .88. The content of item difficulty could represent the characteristics of occupational participation of the participants. Further studies are needed to apply the J-MOHOST for the clients with a variety of disabilities and settings.

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