

The Using of Rasch-Model in Validating the Arabic version of Multiple Intelligence Development Assessment Scale (MIDAS)

Saher Ali Al-Sabbah, See Ching Mey, Ong Saw Lan

Abstract—This article addresses the procedures to validate the Arabic version of Multiple Intelligence Development Assessment Scale (MIDAS). The content validity was examined based on the experts' judgments on the MIDAS's items in the Arabic version. The content of eleven items in the Arabic version of MIDAS was modified to match the Arabic context. Then a translation from original English version of MIDAS into Arabic language was performed. The reliability of the Arabic MIDAS was calculated based on test and retest method and found to be 0.85 for the overall MIDAS and for the different subscales ranging between 0.78 - 0.87. The examination of construct validity for the overall Arabic MIDAS and its subscales was established by using Winsteps program version 6 based on Rasch model in order to fit the items into the Arabic context. The findings indicated that, the eight subscales in Arabic version of MIDAS scale have a unidimensionality, and the total number of kept items in the overall scale is 108 items.

Keywords—Rasch-Model, Validation, Multiple Intelligence, and MIDAS scale

I. INTRODUCTION

MOST if not all counselors and psychologists in schools are familiar with the various measures of human intelligence. In addition, a theory of intelligence is useful to educators, teachers, and school counselors or psychologists only if it leads to a better understanding of how children learn or if it assists in predicting future performance [1]-[2]. However, in the field of the Multiple Intelligence (MI), Gardner [3]-[4]-[5] had detected the theory of multiple intelligences that has been embraced by a range of educational theorists and significantly applied by teachers, administrations, parents and policymakers to the problems of schooling. A number of schools have looked to structure their curricula according to the understanding of MI theory. In his theory, Gardner proposes eight types of intelligence to account for a broader range of human potential in children and adults [6]. Moreover, "Reference [7] indicated that our schools and

culture focus most of its attention on linguistic and logical-mathematical intelligence". We esteem the highly articulate or logical people of our culture.

In the field of measurement and psychology, two psychometric properties of tests based on the theory validity and reliability were established typically to validate a theory of intelligence. Validity refers to the degree to which a test measures its intended attributes or desired outcomes. Although there are many kinds of validity, the most commonly reported in the manual of standardized intelligence tests is concurrent validity. It is usually established by comparing scores on one test with scores of other standardized tests of the same standard [8]. In addition, reliability refers to the consistency of a tests result over time and is usually determined by using one or more of the following methods test-retest, equivalent-form, and split-half. Correlation is the statistical technique that almost all standardized intelligence test use to report the degree of validity and reliability. Validity and reliability are useful measures for testing the theoretical construct that human intelligence is a general ability that remains stable over time [9]. Moreover, the validation of the original English version of Multiple Intelligence Development Assessment Scales (MIDAS) has been examined via a series of investigations, which evaluate its construct, concurrent, and predictive validity. Whereas there is a subset of MIDAS instrument that inquire the active participation and expressed enthusiasm for many of the MI activities. The MIDAS instrument was designed to provide an objective measure of the Multiple Intelligence as reported by the person or by a knowledgeable informant.

II. GENERAL DESCRIPTION OF MIDAS

The Multiple Intelligence Development Assessment Scales (MIDAS) has four general modes of assessment in different ages' groups; the MIDAS for adults is a 106-item self (or other) report. The Teen-MIDAS is a modified questionnaire for people between the ages of 14 and 18. There are two 80 item versions of the MIDAS-KIDS for children ages 9 to 14. The last mode is "my Child" for children ages 6 to 9 years. In addition, in MIDAS, each item uses a six-point Likert scale that permits a range of responses, All the Time or Always (5)

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to I Don't Know (0). Respondents are not forced to provide generalized responses or answer beyond their level of actual knowledge because a zero category is included for every item for when the respondent does not know or the item does not apply. Percentage scores for each scale are calculated only from the total number of responses.

The MIDAS may be administered in less than an hour either by self-completion or as a structured interview. The results may be tabulated in one of two ways: (a) the responses may be entered into an-office computerized scoring program, (b) for bulk use a scanner answer sheet may be sent in for computer processing. As an aid to a more detailed, descriptive interpretation, the MIDAS scoring program provides numerous subscales scores describing a number of skills associated with each intelligence component. Subscales are small, ranging from two to eight items, and are intended to inform a qualitative understanding of the profile rather than serving as precise units of measurement. These subscales were developed in a two-stage process. Step two involved a statistical cluster analysis. The product of these two analyses was between 24 and 29 descriptive subscales that are both theoretically consistent and empirically verified.

MIDAS is widely used in education, career counseling, clinical, and neuropsychology assessment in the U.S.A, whereas, Shearer developed MIDAS for American culture and has demonstrated high reliability and validity properties [10]. In his theory, Gardner has included eight intelligences; these intelligences are measure by MIDAS, which is summarized below:

1. Musical (item 1 to 14)
2. Kinesthetic (item 15 to 27)
3. Math-logical (item 28 to 44)
4. Spatial (item 45 to 59)
5. Linguistic sensitivity (item 60 to 79)
6. Interpersonal (item 80 to 97)
7. Intra-personal (item 98 to 106)
8. Naturalist (item 107 to 119) [5]

III. STATEMENT OF THE PROBLEM

In an attempt to create greater economic success and hopefully fulfillment of one's intellectual potential Jordanian's youth are strongly encouraged to finish their secondary education and obtain a university degree [11]. A high school education is no longer viewed as sufficient in an increasingly technologically dependent world. A major problem faced by secondary schools and universities is that a large percentage of admitted freshmen are not in the appropriate streams of specialization and only about half of them will complete their bachelor's degree. This may be due to the lack of valid instruments that can provide information regarding students' indication in their early education [12]. One useful instrument is to measure students' multiple intelligence. Knowledge of students' MI could categories students accordingly [11]-[13].

The adapted instrument needs to be validated in the context of Jordanian culture and contexts for it to be useful. Many educationists all over the world emphasized that MIDAS scale is designed to measure many aspects of students' MI, which was specifically restrained to the different intelligence factors [10]. In addition, each of the students' intelligence has to have an identifiable core operation or set of operations, as well as susceptibility to coding in a symbol system (e.g., language, mathematics, or musical notes) [14]. Moreover, Brown recommended that the main practical reason for why MIDAS should be used by individuals, parents, teachers, counselors, or psychologists is because MIDAS can obtain information directly from the person's (self-report) experience [15], which could be useful in creating personalized learning plans to enhance the counseling procedures. Furthermore, a valid instrument such a MIDAS can provides Jordanian decision makers, teacher, and parents clear and more comprehensive insight of students' MI and means by which students' intelligence can be measured and upgraded in the Jordanian schools [11]-[12]-[16].

IV. METHOD

This part of study discusses the research methodology and techniques, which are used in this research. In addition, it sets out the rationale for the methodology used and describes the considerations that influenced the development of research techniques and procedures. This study adapts and validates the Arabic version of MIDAS with a sample of secondary schools students in Jordan.

V. RESEARCH DESIGN

The research design used for the present study can be schematically represented as follows:

Three phases were involved in this study; the first phase is the translation and back-translation of MIDAS English version into Arabic language. This was followed by content validity using experts' judgments and the pilot study. The second phase involved the examination of dimensionality for the Arabic MIDAS's subscales. The checking of unidimensionality for each subscale and for the overall MI constructs. The third phase involved comparative design through two modes of Arabic version of MIDAS to measure MI construction and this has been achieved by comparing the results of the two modes of rating MI by self-reporting and teachers' ratings of students' MI. In addition, the researchers adopted the design of validation through judgmental and statistical analysis. The judgmental analysis provided evidence in setting up the content validity, and the statistical analysis established the construct validity and the criterion validity of the Arabic version of MIDAS. The fitting of the data to the Rasch model is used to determine the construct validity, and the consistency between students' self-report and the teachers' rating of MI provide evidence for criterion validity.

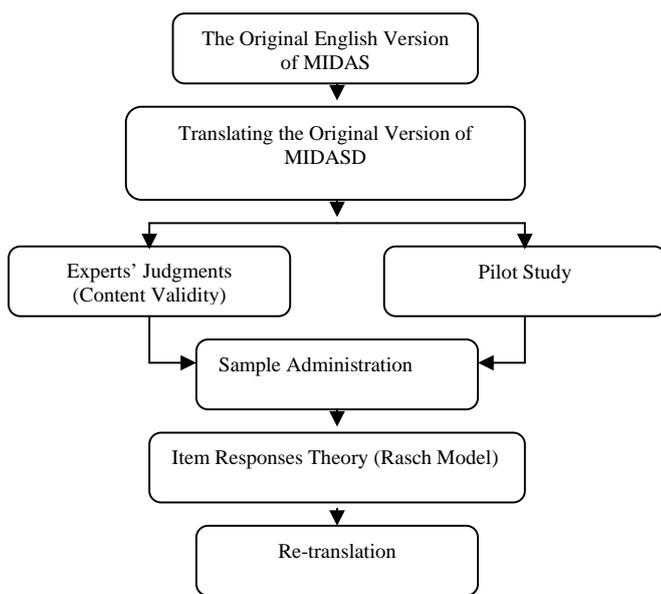


Fig. 1 Research design of the study

VI. POPULATION AND SAMPLE

The population of this study consists of all the students in Irbid governorate situated in north of Jordan, in which the secondary stage is divided into two grades (eleventh grade and twelfth grade). The total number of the students in the secondary schools in Jordan is 193,041, while 18,204 students represented the population of this study. They were distributed in 206 schools with 97 schools for boys and 109 schools for girls in Irbid governorate during the academic year of 2005/2006 [17]. This is due to the similarity of secondary schools in Jordan. Most of them are similar in characteristics, even though, some of them differ in facilities, size and school's location. There are a number of these schools which are known as comprehensive schools. A comprehensive school is one that has a large number of students from different places around the district and has more facilities as in comparison to other schools in the region.

In addition, the sample of this study was randomly chosen from the above-mentioned population. The study employed random stratified sample technique in order to represent the characteristic of the whole population in which a total number of 1,404 students from 13 selected schools were chosen from seven educational directorates in Irbid governorate, which is situated in the north of Jordan. The schools selected included 3 comprehensive schools and 10 high schools from the 7 directorates.

VII. INSTRUMENT

Questionnaires are the most commonly used procedures to acquire data in a research field [18]. In this study, the instrument used is MIDAS scale adopted from Shearer which

was developed in English Language. This instrument attempts to measure Gardner eight intelligence components [10]. In addition, MIDAS provides an array of meaningful real world activities for people to answer the instrument items in self-report or assessment by a knowledgeable informant. The respondents assess the frequency or duration of people performance or their displayed enthusiasm on that activity. The MIDAS contains 119 items measuring eight MI constructs such as music intelligence (item 1 to 14), kinesthetic intelligence (item 15 to 27), math/logic intelligence (item 28 to 44), spatial intelligence (item 45 to 59), linguistic intelligence (item 60 to 79), interpersonal intelligence (item 80 to 97), intrapersonal intelligence (item 98 to 106), and natural intelligence (item 107 to 119).

VIII. PROCEDURES

To validate the adapted instrument of an Arabic version of MIDAS, the researchers used Winsteps program based on Rasch model analysis to measure if it is appropriate for measuring the given construct. The first step after the translation of the items into the Arabic language was to determine the content validity of the instrument. The stringent instrument development processes included items' construction, scale composition, sub-scales creation and the experts' judgments improve the validity of the scale. Gardner himself provided the content validity of the original English version of MIDAS [10]. In the adaptation of MIDAS, this study re-established the content validity of the translated Arabic version of MIDAS by sending the translated version to 10 experts at Al-Yarmouk University in order to determine the content validity. Their comments and suggestions were used to modify and refine the items in the Arabic version. The results showed that, 11 items out of the 119 items were modified and changed in its content. Besides, the researchers conducted a pilot study involving 63 students from two schools in Jordan. The purpose of this pilot study is to determine the overall reliability for the Arabic version of MIDAS and the reliabilities of its subscales. The reliability coefficient computed was obtained using test-retest method. In addition, the translated Arabic version was also validated using data collected from the 1,404 students. The fit between the data and the Rasch-model was examined to establish the construct validity of the scale.

IX. DATA ANALYSIS AND FINDINGS

Basically, the infit mean square (MNSQ) statistics has been used to identify item's ratings that deviate from expectations, range from zero to positive infinity. The infit MNSQ statistics' value is the ratio of observed variance (variance attributable to the data) to expected variance (variance estimated by the Rasch measurement model). The ideally ratio of MNSQ value is 1.0, according to the observed variance equals expected variance [19]. The items were considered misfit to the model according to Linacre and Wright [19] if the item has infit

MNSQ value exceeding the range of 0.6 - 1.4 for the Likert scale.

The findings in this study are divided into two parts:

Part 1: The Examination of Construct Validity for the Overall Arabic MIDAS

The results from the examination of the construct validity for overall MIDAS scale by using the Winsteps program based on Rasch model are as follows:

(1) The first run of Winsteps program examined the construct validity for the overall MIDAS scale based on the infit and outfit values for the 119 items.

TABLE I
 THE WINSTEPS PROGRAM (FIRST RUN)

Excluded Item	The Item in the Original Scale
(2) first run	2. Did you ever learn to play an instrument?
(5) first run	5. As an adult, did you ever play an instrument, play with a band or sing with a group?
(7) first run	7. Do you ever make up songs or write music?
(11) first run	11. Do you have a good sense of rhythm?
(13) first run	13. Do you think you have a lot of musical talent or skill that was never fully brought out?
(107) first run	107. Have you ever raised pets or other animals?
(109) first run	109. Have you ever done any pet training, hunting or studied wildlife?
(116) first run	116. Are you fascinated by natural energy systems such as chemistry, electricity, engines, physics or geology?

In Table I the results shown that there were eight misfit items, they were item 2, item 5, item 7, item 11, item 13, item 107, item 109, and item 116 on the calibration. These items were considered misfit to the model according to Linacre and Wright [19] if the item has infit MNSQ value exceeding the range of 0.6 - 1.4 for the Likert scale.

(2) After removing the eight items, a second run of Winsteps program was carried out for the remaining 111 items.

TABLE II
 THE WINSTEPS PROGRAM (SECOND RUN)

Excluded Items	The Item in the Original Scale
(3) second run	3. Can you sing 'in tune'?
(38) second run	38. Are you a curious person who likes to Figure out WHY or HOW things work?
(98) second run	98. Do you have a clear sense of who you are and what you want out of life?

In Table II the results shown that there were three-misfit items and they were item 3, item 43, and item 103 on the calibration.

(3) The third run of Winsteps program for the remaining 108 items found that all items fitted the Rasch model without any misfit item.

Finally, the examination of MIDAS constructed validity for the overall scale provides the Arabic version of MIDAS scale with 108 infit items was conducted. The results excluded 11 items that have been removed from the Arabic version of MIDAS scale as in Table I and Table II.

Part 2: The Examination of Construct Validity for the Arabic

MIDAS's Subscales

The conclusion from the examination of the dimensionality of Arabic MIDAS is clarified in Table III.

TABLE III
 THE RESULTS OF EXAMINING THE DIMENSIONALITY OF EIGHT MIDAS'S SUBSCALES

Type of Intelligence	Reliability of Items	Excluded items	No. of Excluded Items	No. of Items in Arabic MIDAS
Music	0.99	I 2, I 5, I 7, I 11, I 13, and I 3 in second run)	6	8
Kinesthetic	0.95	-	0	13
Math/Logic	0.95	-	0	17
Spatial	0.92	I 38	1	14
Linguistic	0.92	-	0	20
Interpersonal	0.82	-	0	17
Intrapersonal	0.96	I 98	1	9
Natural	0.99	I 107, I 109, and I 116	3	10
Total			11	108

From Table III, we conclude that the analysis of the dimensionality of the Arabic MIDAS's subscales produced eleventh misfit items, and they were excluded and removed from the total number of 119 items. These items were item 2, 5, 7, 11, 13, and 3 (second run) in first run of Winsteps program for Musical Intelligence; item 38 for Spatial Intelligence; item 98 for Intrapersonal Intelligence; and item 107, 109, and 116 for Natural intelligence. Moreover, the remaining items in MIDAS fitted the unidimensional model.

X. DISCUSSION

In general, the findings of this study indicated that the content of 11 items in the Arabic version of MIDAS needs to be modified to match the Arabic content. The reliability coefficient computed was obtained using test re-test method and has a value of 0.85 for the overall MIDAS and for the different subscales ranging between 0.78 - 0.87. In addition, the Winsteps program based on Rasch model was used to examine the construct validity of the overall Arabic MIDAS and its subscales. The results revealed that 11 items were removed from the Arabic version (items 2, 3, 5, 7, 11, 13, 38, 98, 107, 109, and 116) and the remaining 108 items formed the final Arabic version of MIDAS. The internal consistency coefficients for the different MIDAS's subscales were in the range of 0.82 to 0.99.

In our discussion about the findings, the Rasch model analysis clearly demonstrated that the Arabic version of MIDAS scale has high reliability for the items. Furthermore, the output of Rasch analysis based on infit MNSQ values in the range of 0.6-1.4 was used to determine the fit of the items. Eleven items were excluded, six of the items were from music intelligence subscale, three items were from natural intelligence subscale, one item from intrapersonal intelligence subscale, and one item was from kinesthetic intelligence

subscale. In addition, the discussion about the eight subscales, begin with the music intelligence subscale that consisted of 14 items, where items 2, 5, 7, 11, 13, and item 3 in second run in this subscale were excluded. A closer examining of item 2 in the MIDAS scale "Did you ever learn to play an instrument?" The Arabic culture as a part of Muslim culture does not give the same attention for the musical aspect as other objectives e.g. mathematics, linguistic etc [12]. Item 2 asked the students if they learned to play any instrument, while the Jordan's schools have only one musical band in every school and the rest of students in these schools has lower chance to play any instrument if they are not involved in these bands.

XI. IMPLICATIONS OF THE STUDY

From the investigation of the MIDAS validity in this study, the validated Arabic version is effective in measuring students' MI in their schools. The examination and adaptation of the items revealed that, the items are matching with the Arabic culture, which enable the Arabic educators to use an Arabic version of MIDAS in measuring students' MI in any Arabic region. There are several implementations of the MIDAS instrument for the educators, companies, and students. The Arabic version of MIDAS in this study provides a lot of information about the students' MI in their early education and in their secondary schools. This instrument can be helpful for students to understand themselves and their specific strength and weaknesses

In addition, one of the implications of the Arabic version of MIDAS for students is the vocational counseling, which enables them to determine whether to continue their studies in the academic stream or in the vocational stream based on their intelligence inclinations and interests, which can be measured by using MIDAS scale.

In the education field, the MI theory should be included into the educational system in Jordan in order to involve students with various activities that may be able to improve their Multiple Intelligence skills.

The use of Arabic MIDAS was found to be very helpful in this study. If the educators are not using intelligence instrument in measuring their students' intelligence abilities, the teachers will have unclear idea about their students' intelligence level.

The Arabic version of MIDAS in this study provides teachers with additional information in their students' thinking and behaviorism. Furthermore, Arabic MIDAS can be used by teachers and counselors during counseling sessions. The information obtains from the teachers' rating of their students' MI in this study, may be useful to categories students, and the means by which these categories best deal with.

In the education field, the MI theory should be included into the educational system in Jordan in order to involve students with various activities that may be able to improve their Multiple Intelligence skills.

XII. RECOMMENDATIONS OF THE STUDY

Based on the findings and results of this study and in light of students' current situation, the following recommendations and suggestions were formulated:

1. The use and the practice of MIDAS instrument into the consulting processes in Jordan's schools will enable the teachers and the counselors to better understand their students' intelligences. Both teachers and students can use MIDAS instrument to promote the use of strength-based learning activities to enhance instructional practice as well as personal development in validating Arabic MIDAS instrument.
2. The adapted and validated Arabic version of MIDAS can be used by teachers and parents to assist the students in vocational counseling to determine whether to continue their studies in the academic schools or in the vocational schools based on their intelligence strengths and interests, which can be measured by using MIDAS scale.
3. The adapted and validated Arabic version of MIDAS can be used in Jordanian companies to provide these companies with information within the career development field as to how workers might successfully employ their more dominant intelligences. The MIDAS provides an objective measure of the Multiple Intelligence as reported of a person by the person or a knowledgeable informant and the applicability of the Arabic version of MIDAS in career exploration for selecting employees for suitable jobs based on their intelligence strengths.
4. The contents and certain aspects of An Arabic version of MIDAS need to be included into the schools' content, in order to make them more suitable for both teachers and students. Content such as the music intelligence that can be represented in the school content by the enhancement of the music curriculum activities, and by giving attention to nature the students' various talents, this can be applied on all the remaining aspects in MIDAS, as the kinesthetic intelligence, mathematic/logic intelligence, .Etc

Finally, base on the findings of this study it is recommended that the students' self-report can be regarded as a reliable source for determining students' MI

REFERENCES

- [1] H. Gardner, *The Unschooled Mind: How Children Think And How Schools Should Teach*. Library of Congress Cataloging. In Publication Data, 1991, United States of America: Fontana Press, pp. 11-13.
- [2] Gardner, H. (2004). *Audiences for the theory of multiple intelligence*. Teacher College Record. Columbia University, vol.106 no.1. pp 212-220. January 2004.

- [3] H. Gardner, *Frames of Mind: The theory of multiple intelligences*. Library of Congress Cataloging. In Publication Data, 1983, New York: Basic Books, pp. 3-12.
- [4] H. Gardner, *Frames of mind (10th anniversary edition The theory of Multiple Intelligences*. Library of Congress Cataloging. In Publication Data, 1993, New York: Basic Books, pp. 73-237.
- [5] H. Gardner, *Intelligences reframed*. Library of Congress Cataloging. In Publication Data, 1999, New York: Basic Books, pp. 27-47.
- [6] A. Thomas, "Multiple intelligences: Seven ways to approach curriculum. *Educational Leadership*", vol 52, pp. 26-33, 1994.
- [7] H. Gardner, "Project Zero: Nelson Goodman's legacy in arts education". *Journal of Aesthetics and Art Criticism*, vol. 58 no.3, pp. 245-249, march 2000.
- [8] G. I. Esters, F. Ittenbach, "Contemporary theories and assessments of Intelligence: A primer. *Career and Technical Education*,". University of Southwestern Journal. val 2, pp.373-376, 1999.
- [9] J. Q. Chen, "Theory of Multiple Intelligence: Is it a scientific theory?" *Teacher College Record*," vol 106, no 1, pp. 17-23, January. 2004
- [10] B. Shearer, (1996). *The MIDAS: A professional manual. Multiple Intelligences research and consulting*," Kent, Ohio, 106 (1). pp.17-23. available <http://www.tcrecord.org>.
- [11] M. Nofal, and M. Alhileh, " The Differences between Multiple Intelligences among freshman students enrolled at UNRWA Higher Education in Jordan." *Alnjah for Researchs (Social Science)*, vol 5 no 22, pp. 1-25, 2003.
- [12] A. Jabber, *Multiple Intelligence and the implementation in the school (1 ed.)*. Cairo- Egypt. April 2004.
- [13] Y. K. Sarayrah, *Resistance to innovative teaching methods in public administration education in Jordan*. Jordan-Amman. Yarmouk University: Dar Al-Ama'an, 2003, pp. 22-47.
- [14] A. Feldman, "Evolution as a metaphor for the conceptual change model: implications for the teaching and learning of science," *Conference of The Annual Meeting of the American Educational Research Association*, San Diego, CA, 1998.
- [15] J. D. Brown, "Using surveys in language programs". Cambridge: Cambridge, University Press
- [16] K. Dababneh, "The Factors that effect the gifted students' thinking and intelligence in Jordanian schools". Master dissertation, dep. Faculty of Education, The Jordanian University, Jordan-Amman, March 1998
- [17] Ministry of Education, "The statistical report of Jordanian ministry of education" HKJ Amman, Jordan: Department of Planning and Statistics. 1999/2000.
- [18] E. Stone, "Research methods in organizational behavior" Glenview, IL: Scott, Foresman, vol 4. 1978.
- [19] J. M. Lincare, and B.D. Wright, B. D, *A user's guide to Winsteps. Rasch model computer program*: MESA Press 2000, pp. 7-62.