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**RESEARCH PAPER**

# Reliability and Validity of Walter's Multiple Intelligences Survey in Pakistan

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**ABSTRACT**

The present research is an effort to a series of psychological assessments of intelligence survey concerning Pakistani cultural contex and assess the reliability and validity of the multiple intelligences survey (MIS) by Walter McKenzie. The cross-sectional research design has been implemented and purposive sampling was utilized to collect participant data. The sample was comprised of BS (Hons.) university students from Punjab, and their age range was 18 years to 24 years (M = 21.18, SD = 2.08). The study consisted of two phases. In phase one data screening and a pilot study were conducted, and in phase two psychometric properties and validity (confirmatory factor analysis) were examined. Findings indicated that the MIS is a reliable and valid instrument. The confirmatory factor analysis emerged nine factors with 41 items. The overall reliability of the MIS was acceptable (α = .88). It has been recommended to explore this construct in-depth. In addition, this instrument could be utilized for screening purposes in educational and psychological assessments.

**Keywords:** Intelligence, Psychometrics, Survey, Young Adults

## Introduction

The first formal intelligence test was developed by Binet-Simon to identify school children who needed extra attention regarding daily activities, Later, the measurement of intelligence (known as IQ) was introduced by William Stern, in the twentieth century. Moreover, Binet was the first person to introduce the concept of mental age (MA), and he identified individual differences in the distinct set of abilities. Since that time, many other intelligence tests have developed. However, it is still a debatable topic, because many other researchers do not agree on its definition, use of intelligence tests, and expected cultural biases (Eysenck, 1973; Fletcher & Hattie, 2011). Therefore, the present research aims to establish a reliable and valid measure of multiple intelligences in the Pakistani cultural context.

The primary objective of this study was to assess the multiple intelligences survey (MIS) for young adults in Punjab, Pakistan. Because of the lack of research on multiple intelligences among university students in the Pakistani cultural context. However, in the literature, much of the attention was given to emotional, social, spiritual, and general intelligence (verbal and non-verbal) among school children or secondary school students (e.g., Shahzada, & Khan, 2014; Shahzada, Khan, Allah Noor, & Rahman, 2014). To the best of the researcher's knowledge, no indigenous research has been done on young adults (aged: 18 to 24 years) regarding multiple intelligences. In addition, the literature review clearly showed that already developed multiple intelligences assess the perception of intelligence (i.e. Shahzada, & Khan, 2014; Shahzada et al., 2014). Secondly, Walter's measure of multiple intelligences can help to examine the academic and social context of various types (i.e. screening, evaluation, and future directions). So that we could take further steps in the future to promote the identified factors to optimize the academic endeavors of young adults (18 to 24 years).

In Pakistan, since 2000 intelligence testing has given main attention to the academic and social interactions in higher education (Higher Education Commission Pakistan, 2022). In addition, these studies have given attention to verbal, non-verbal, and emotional intelligence in Pakistan, and these studies mainly focus on the translation of already developed measures of multiple intelligence (Shahzada, 2014; Shahzada, & Khan, 2014; Shahzada, et al., 2014). Moreover, general intelligence was measured in different contexts in Pakistani culture (e.g., HECP). Therefore, the present research is an effort to establish the new multiple intelligences measure for screening young adults in university sectors. It was also necessary as the previous measures on intelligence are too lengthy (hundred plus items) or difficult to assess in Pakistani culture.

On the other hand, the primary questions regarding intelligence were that (a) it is a single or multiple ability/skills (b) nature-nurture roles in intelligence (c) biases in tests (d) relative important aspects of intelligence in daily life**.** Therefore, the primary questions were raised by psychometricians about the outcomes, nature, and conceptualization of intelligence (Wolman, 1985). Since the 1900s various theories of intelligence have emerged, and here some prominent theories are discussed below.

Spearman (1904) described the concept of general intelligence (called as g-factor). The strength of this theory was that it was developed by factor analysis. He concluded that scores on these tests were similar to the other cognitive ability tests. In addition, Spearman demonstrated that intelligence could be measured and numerically expressed (Jensen, 1998). In contrast, the theory of intelligence was proposed by Thurstone as a unique theory of intelligence and primarily focused on seven distinct types of intelligence. Following are seven mental abilities (primary mental abilities) proposed by Thurstone.

- Spatial visualization– understanding puzzles, space figure relations, geometric angles
- Word fluency– communication skills, word smart
- Perceptual speed– picture organization, findings letters, or words
- Numerical ability–quick and accurate numerical ability
- Reasoning– generally related to classification (e.g., words)
- Associative memory–remembering tasks like word list
- Verbal comprehension–related to comprehension and word use (Thurstone, 1938).

Similarly, Sternberg defined intelligence as "mental activity directed toward purposive adaptation to, selection and shaping of, real-world environments relevant to one's life." (Hunter, 2009, p.1198). Sternberg described the three-factor theory of intelligence known as creative, practical, and analytical intelligence (Sternberg, 1985).

- Analytical intelligence— e.g. solving logical puzzles
- Creative intelligence— adaptability to new situations.
- Practical intelligence— e.g., practical solutions in real-time (Sternberg, 1988).

The most recent and debated theory was proposed by Howard Gardner. He suggested that human intelligence should not be limited to one and dominant intelligence, and all intelligence are important and equal (for instance a scientist and musician are equally important). Moreover, these intelligences could be strengthened and applicable in academic settings. He proposed eight distinct intelligences based on abilities and skills that are valued in different cultures (Gardner, 1993, 1983). However, some other component like existential, spiritual, and moral intelligence (Gardner, 1999) was later proposed, and these are still under experimental trials. The critics of the MI suggested that its definition and types are ambiguous i.e. confused as cognitive or behavioral or brain activity (Anderson, 1992), and Gardner's concept of intelligence neglects knowledge as the basis for intelligence (Nolen-Hoeksema et al., 2009). Similarly, McKenzie (2005) supports the multiple intelligences theory proposed by Gardner and suggests the nine-factor model of multiple

intelligences. Furthermore, he summarized the nine components into three major domains i.e. analytical, interactional, and introspective intelligences. However, this theory is still under empirical testing and could be a future direction of MI testing.

The present study aimed to assess the multiple intelligences concept in Pakistan. To the best of the researcher's knowledge, no indigenous measure of this multi-faced construct is available in Pakistan. However, some translated or survey measures were available in Pakistan (e.g., Shahzada, et al., 2014). McKenzie's survey of multiple intelligences was selected as the screening instrument because it was convenient and suitable for the psychometric point of view. Therefore, the research gap regarding multiple intelligences construct could be estimated in the current study.

## Material and Methods

### Research Design

The present study is quantitative and consists of two phases. In phase one pilot study and item screening has been done. In the second phase reliability and validity of Walter's MIS was examined. The cross-sectional research design was utilized in the current study. This design is suitable when different groups of participants are required at a time (Olsen & George, 2006).

### Inclusion/Exclusion Criteria

The samples consisted of BS (Hons.) students from different universities. The minimum age range is between 18 to 24 years (young adults) and at least education of 12 years as inclusion criteria. The exclusion criteria included students with any disability and specific medical condition(s).

### Phase I

### Sample I

Purposive sampling was used to recruit the participants from various universities of Punjab, Pakistan. Sample one consisted of BS (Hons) university students ($N$ = 39) with an age range from 18 years to 24 years ($M$ = 22.18, $SD$ = 1.45). This sample was utilized for a pilot study and cleansing of the items. Initially, 50 participants were recruited, but 39 participants fulfilled the study requirement.

### Procedure

Firstly permission has been taken from the respective department for the data collection. The instructions were delivered to the participants before taking any responses and queries were answered during the data collection process. The questionnaire consisted of informed consent, demographic information (age, gender, and study field), and multiple intelligences survey among the participants. Initially, MIS consisted of 90 items (nine components), and during the item screening process, 52 items were subjected to the validity process. The twenty-eight items were discarded during the pilot study based on item-total correlation $r < .30$, and ten items were discarded due to non-normality.

### Phase II

### Sample II

Purposive sampling was used to recruit the participants from different universities in the Punjab. Sample two consisted of BS (Hons) university students (men = 70, women = 73) with an age range from 18 years to 24 years (young adults $M$ = 21.18, $SD$ = 2.08). Initially,

*N* = 180 participants were recruited for reliability and validity assessment. However, a total of 143 participants remained, and these participants fulfilled the inclusion criteria.

**Table 1**
**Frequency and Percentage of Demographic Variables**

| Variable | Frequency (*f*) | Percentage (%) |
|---|---|---|
| Age Group | | |
| 18 to 20 Years | 53 | 37.10% |
| 21 to 24 Years | 90 | 62.90% |
| Gender | | |
| Men | 70 | 49.00% |
| Women | 73 | 51.00% |
| Groups | | |
| Science | 44 | 30.80% |
| Arts | 67 | 46.90% |
| Information technology (IT) | 21 | 14.70% |
| Commerce | 11 | 7.70% |

Table 1 shows the demographic information of the participants i.e. age, gender, and field groups. It was found that 18 to 20 years were 37.10 %, and 21 to 24 years were 62.90 %. In addition, men were 49.0 % and women were 51.0 %. The participants belonged to different fields of study i.e. science 30.80 %, arts 46.90 %, information technology 14.70 % and the commerce group 7.70 %.

## Procedure

In phase two, permission was taken from the respective departments for the data collection. The instructions were delivered to the participants before taking any responses and queries were answered during the data collection process. The questionnaire consisted of informed consent, demographic information (age, gender, and study field), and multiple intelligences survey among the participants. A total of 52 items were subjected to the validity process. It was found that 11 items were further discarded during the CFA process, and the final 41 items were considered for psychometric properties.

## Instruments

### Multiple Intelligences Survey (MIS)

This instrument was developed by McKenzie (2005; 2017) to assess the intelligences according to Howard Garner's theory of multiple intelligences. It was comprised of 90 items (English language), but in the present study, 41 items were finalized during the psychometric process. There were no reverse items in the instrument and the scoring range from 5 = strongly agree to 1 strongly disagree (i.e. Likert type scale). In addition, it also assesses components of the Gardner's theory i.e. naturalistic (5-items), musical (4-items), logical (4-items), existential (5-items), interpersonal (6-items), kinesthetic (4-items), verbal (4-items), intrapersonal (5-items) and visual (4-items), and reflects the strength (high and low scores) of particular domain respectively. The Cronbach's alpha of the MIS was satisfactory (α =.88).

## Ethical Considerations

Firstly, permission from the head of departments was sought. After that informed consent was taken from the participants along with the other forms (demographic and MIS). The participants were informed about their rights and benefits of the study. There were no psychological or physical harms observed in to current study.

## Results and Discussion

The present study aimed to assess the psychometric properties of Walter's multiple intelligences survey. The results section describes the reliability and validity (confirmatory factor analysis of Walter's Instrument).

**Phase I: Pilot Study**

The pilot study was conducted to screen the psychometric properties of the 90-item multiple intelligences survey by McKenzie (2005; 2017). Firstly, missing items and errors were cleared at this phase. Further, item analysis was conducted with the help of item-total correlation (cut-off: $r > .30$ for the selection of items), and normality was computed for each item. In addition, no potential outliers were observed in the current study.

**Phase II: Reliability and Validity**

**Table 2**
**Psychometric Properties of Walter's Multiple Intelligences Survey**

| Scale | *M* | *SD* | Range | Cronbach's α |
|---|---|---|---|---|
| 1.Naturalistic | 17.27 | 3.30 | 8 – 25 | .53 |
| 2. Musical | 13.71 | 3.42 | 4 – 20 | .67 |
| 3. Logical | 14.68 | 2.84 | 6 – 20 | .67 |
| 4. Existential | 19.74 | 3.72 | 7 – 25 | .70 |
| 5. Interpersonal | 21.20 | 4.56 | 9 – 30 | .74 |
| 6. Kinesthetic | 15.68 | 2.46 | 7 – 20 | .54 |
| 7.Verbal | 12.27 | 3.27 | 4 – 19 | .60 |
| 8.Intrapersonal | 20.73 | 2.95 | 12 – 25 | .67 |
| 9.Visual | 15.32 | 2.89 | 6 – 20 | .60 |

Note. $N = 143$. α = alpha coefficient (internal consistency)

Table 2 shows the mean, standard deviation, score range, and alpha coefficients of the multiple intelligences survey (MIS). Results indicated that all sub-scales of multiple intelligences were in the acceptable range i.e. naturalistic (α = .53), musical (α = .67), logical (α = .67), existential (α = .70), interpersonal (α = .74), kinesthetic (α = .54), verbal (α = .60), intrapersonal (α = .67), and visual (α = .60).

**Table 3**
**Final Factor Loadings of Multiple Intelligences Survey (CFA)**

| Sr. | Factor | Item number and Factor Loading |
|---|---|---|
| 1 | Naturalistic | 1(.32), 2(.65), 3(.48), 4(.43), 5(.34) |
| 2 | Musical | 7(.84), 8(.54), 9(.32), 10(.43) |
| 3 | Logical | 11(.61), 12(.73), 13(.53), 14(.50) |
| 4 | Existential | 15(.73), 16(.63), 17(.49), 18(.60), 19(.45) |
| 5 | Interpersonal | 20(.63), 21(.63), 22(.39), 23(.50), 24(.74), 25(.37) |
| 6 | Kinesthetic | 26(.34), 28(.40), 29(.43), 30(.77) |
| 7 | Verbal | 31(.46), 32(.56), 34(.68), 35(.42) |
| 8 | Intrapersonal | 36(.72), 37(.63), 38(.55), 39(.33), 40(.38) |
| 9 | Visual | 41(.50), 42(.75), 43(.43), 44(.43) |

*Note*. $N = 143$, $k = 41$ (items), all factor loadings > .30 (standardized)

Table 3 shows the standardized factor loading of confirmatory factor analysis of multiple intelligences survey (MIS). Results indicated that naturalistic domain consists of 5 items (loading range .32 to .65), musical domain 4 items (loading range .32 to 84), logical domain 4 items (loading range .50 to .73), existential domain 5 items (loading range .45 to .73), interpersonal domain 6 items (loading range .37 to .74), kinesthetic domain 4 items (loading range .34 to 77), verbal domain 4 items (loading range .42 to 68), intrapersonal domain 5 items (loading range .33 to .72), and visual domain 4 items (loading range .43 to .75).

**Table 4**
**Result of Confirmatory Factor Analysis of the Walter's Multiple Intelligences Survey**

| Model | $\chi^2$ | *df* | NFI | CFI | RMSEA |
|---|---|---|---|---|---|
| Naturalistic | 4.56 | 5 | .91 | .99 | .00 |
| Musical | .61 | 1 | .99 | .99 | .00 |
| Logical | .94 | 2 | .99 | .99 | .00 |
| Existential | 9.60 | 5 | .93 | .96 | .08 |
| Interpersonal | 10.73 | 7 | .94 | .98 | .06 |
| Kinesthetic | 1.03 | 2 | .98 | .99 | .00 |
| Verbal | 5.58 | 2 | .91 | .94 | .07 |
| Intrapersonal | 5.2 | 4 | .95 | .99 | .05 |
| Visual | 1.07 | 2 | .98 | .99 | .00 |

*Note*. $N$ = 143, All chi square values are non-significant.
*$p$ < .05, **$p$ < .001, $p$ = ns (non- significant)

Table 4 shows the confirmatory factor analysis of Walter's multiple intelligences survey (MIS). Results indicated that all the fit indices were in the acceptable range i.e. CFI and NFI ≥ .90, $\chi^2$ ($p$ = ns), and RMSEA < .10. Therefore, it was concluded that the models were acceptable.

**Table 5**
**Correlations among the Sub-scales of Multiple Intelligences Survey**

| Variable | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|
| 1.Nature | – | .29** | .26** | .34** | .27** | .22** | .16* | .22** | .26** |
| 2.Music | | – | .30** | .34** | .24** | .30** | .31** | .28** | .42** |
| 3.Logic | | | – | .46** | .26** | .22** | .33** | .31** | .46** |
| 4.Exist | | | | – | .33** | .31** | .46** | .50** | .39** |
| 5.Interp | | | | | – | .38** | .33** | .24** | .25** |
| 6.Kinest | | | | | | – | .29** | .39** | .35** |
| 7.Verbal | | | | | | | – | .18* | .25** |
| 8.Intrap | | | | | | | | – | .36** |
| 9.Visual | | | | | | | | | – |

*Note*. $N$ = 143.
**$p$<.001, *$p$<.05

Table 5 shows the Pearson correlation analysis among multiple intelligence domains. Results indicated that all domains are positive and significantly correlated with each other ($r$ ranging from .16 to .50). It reflects the satisfactory correlations among the factors (i.e. not moderate to high), and it also indicated the factorial validity of the new measure (Byrne, 2001).

## Discussion

The present study aims to assess the psychometric properties and validity of Walter's multiple intelligences survey in Punjab, Pakistan. The intelligences is a broad topic of interest and it plays an important role in everyday life. The education system stresses the implementation of various intelligences. There is a dire need to address this topic concerning Pakistani cultural context due to its importance related to academic outcomes like career decision-making (Pong & Leung, 2023), performance (Doblon, 2023), and assessment (Rakhman et al., 2023).

The first objective of the study was screening and evaluation of Walter's multiple intelligences survey among university students of Punjab, Pakistan. This objective was achieved with the help of frequency distribution, error correction, and various assumptions fulfillment (e.g., normality tests, graphs, and samples). Initially, the MIS consisted of ninety

items but during the screening process, twenty-eight items were discarded based on corrected item-total correlation criteria (5, 8, 12, 13, 17, 18, 20, 21, 22, 24, 25, 27, 30, 31, 33, 36, 39, 43, 57, 61, 62, 64, 65, 69, 71, 77, 85, 87). In addition, ten items were excluded due to non-normality. The cut-off for item-total correlation was .30 (Field, 2013). It is also evident that this technique also serves as item analysis (Tariq, 2014). The initial steps (item screening and cleansing) are crucial to the assessment process, without this process later assessment could be inaccurate or may be futile (Tariq & Batool, 2016).

The last objective of the study was to assess the reliability and validity of Walter's multiple intelligences survey among university students in Punjab, Pakistan. The findings of the study suggested that the new MIS is reliable and all psychometric properties (alpha coefficient, mean, standard deviation, and score ranges) are acceptable. In social sciences, a minimum .50 alpha level is required. However, different studies could set their cut-off based on the understanding level of the construct under investigation (for instance .70 is the ideal cut-off for psychological measures (George & Mallery, 2019). However, many other factors affect this practice e.g., sample size, number of items, conceptual clarity of the measure, and assessment processes (Reinhardt, 1991). Secondly, in phase two validity of the MIS has been assessed with the help of confirmatory factor analysis on AMOS. It is a complementary part of validation studies after running the EFA, however, it could be implemented on already validated measures without exploratory factor analysis (Hurley et al., 1997). In addition, model fit indices indicate the accuracy of the validation process related to CFA, and these include comparative fit index (CFI), normed fit index (NFI), and root mean square error of approximation (RMSEA). In the present study the model fit indices were satisfactory i.e. CFI and NFI > .90 and RMSEA less than .10 respectively (Byrne, 2001). The reliable factor solution could be estimated based on cut-off $r > .30$ to .50. On the other hand, a correlation matrix with low correlation values reflects the factorial validity of the sub-scales of MI (Arifin et al., 2012). In summary, the new measure of multiple intelligences by Walter is reliable and valid for diagnostic use in educational settings. The present research supports the Gardner and McKenzie models of multiple intelligences.

## Conclusion

It has been concluded that Walter's measure of multiple intelligences is reliable as all the coefficients of reliability for all nine domains were in acceptable range and confirmatory factor analysis (CFA) suggested that the measure is also valid. Similar findings are found in the correlations among the nine domains. The low to moderate correlations suggest the factorial validity of the MIS as factors are independent of each other.

## Recommedations

The first limitation of the present study was that the sample was collected from Punjab, only, and in future studies of this nature other provinces could be included to improve the generalizability of MIS. Secondly, the generalization of the findings is limited to the student population only particularly university students. The research design in the present study was not based on the casual model, and thus it is limited to the descriptive model of MIS. There is no perfect model of psychological constructs, and it is recommended to use a combination of different strategies to get a better picture of the construct under investigation.

## Implications

The present research supports the model of Gardner's theory of multiple intelligences. It is evident in the current study that MIS is a reliable and valid instrument, and it could be utilized as a screening instrument to identify the strengths and weaknesses of students in classroom settings. The identified factors could be improved by teaching various learning skills in classroom settings.

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