ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

STRUCTURE AND CHARACTERISTICS OF ADAPTIVE BEHAVIOUR SCALES OF CHILDREN WITH INTELLECTUAL DISABILITY: AN ANALYTICAL STUDY.

Tameem Yahya Ali Mohammed Basha[1], S. Rajaguru[2].

1. Ph.D. Scholar at Ramakrishna Mission Vivekananda University, Coimbatore, India & Assistant Professor at Ibb University, Yemen.
2. Professor in Education at Sri Ramakrishna Mission Vidyalaya College of Education, Coimbatore, India.

Manuscript Info

Manuscript History:

Received: 14 January 2016
Final Accepted: 25 February 2016
Published Online: March 2016

Key words: Adaptive behaviour scales, Intellectual disability, Psychometric characteristics, Factor structure.

Corresponding Author

Tameem Yahya Ali Mohammed Basha.

Abstract

The present study has been analyzed 30 scales and 52 studies relevant to adaptive behaviour assessment of children with intellectual disability (CWID) to identify the common structure and psychometric characteristics of the adaptive behaviour scales (ABSs) of CWID. The analyzed studies and scales were administered and standardized on samples of CWID in 15 countries around the world. Qualitative analysis using triangulation analysis method and quantitative analysis using frequencies and percentages were done to attain the objectives of the study. The results revealed that there are 5 common domains and 19 sub-domains that need to be considered while developing the ABSs for CWID. The main domains include daily living skills, communication skills, social skills, motor skills, and academic and conceptual skills. It was also found that 8 methods of validity and 6 methods of reliability were used for standardizing the scales. The most commonly used methods were construct validity, concurrent validity, test-retest reliability, inter-rater reliability and internal consistency. All the reviewed studies of factor analysis emphasized on the multidimensional structure of ABSs which ranged from two-factor model to five-factor model. The results of this study may help the researchers in the field to understand the common structure and standardization methods to be considered and adopted while developing and standardizing the ABSs for CWID.

Introduction:-

Adaptive behavior has been an integral part of the long history of mental retardation and its definition. In the 19th century, mental retardation was recognized principally in terms of a number of factors that included awareness and understanding of surroundings, ability to engage in regular economic and social life, dependence on others, the ability to maintain one's basic health and safety, and individual responsibility (Brockley, 1999). Today, fulfillment of these personal and social responsibilities, as well as the performance of many other culturally typical behaviors and roles, constitutes adaptive behavior.

Adaptive behaviour assessment scales of CWID, in the contemporary time, have a crucial role in the diagnostic process and preparing the educational programmes for those children. The importance of adaptive behaviour assessment in the field of intellectual disability is resulted from the obvious effect of the intellectual disability on the normative behaviour of CWID and their deficits to meet the living requirement as per the norms of the society.

Adaptive behaviour assessment measures began to appear during the 1920s when Doll, Kuhlmann, and Porteus sought to develop assessment practices consistent with a definition of mental retardation that emphasized adaptive behavior and social competence. Edgar A. Doll developed the Vineland Social Maturity Scale (Vineland SMS) in

1935 to measure the performance of everyday activities, and it was the primary measure used to assess adaptive behavior, social competence, or social maturity for several decades. In the second half of the 20th century, many adaptive behaviour scales were developed and standardized in different countries such as American Association of Mental Deficiency-Adaptive Behaviour Scale (AAMD-ABS) which first version was developed by Nihira and his colleagues in 1969, Madras Developmental Programming System MDPS (Jeyachandran & Vimala, 1972), Scales of Independent Behavior SIB (Bruininks et al., 1984), Adaptive Behavior Inventory ABI (Brown & Leigh, 1986), Behavior Rating Profile, second edition (Brown & Hammill, 1990), Behavioural Assessment Scale for Indian Children with Mental Retardation BASIC-MR (Peshawaria & Venkatesan, 1992), and the process of developing and adapting such adaptive behaviour scales is going on in the 21st century. Some of the developed adaptive behaviour scales have been revised one or more times to improve their quality and effectiveness like American Association of Mental Deficiency-Adaptive Behaviour Scale (AAMD-ABS), Vineland Adaptive Behavior Scales (Vineland ABS), Adaptive Behavior Assessment System (ABAS), Scales of Independent Behavior, and Behavior Assessment System for Children (BASC).

At the beginning, the purpose of adaptive behavior assessment scales for CWID was to determine the current performance levels of those children for developing their educational programmes based on their levels of performance. Recently, the adaptive behavior scales are used for educational programming and can be used, also, for the purpose of diagnosis and classification as there is high correlation between the IQ level and adaptive behaviour performance of CWID as proved by many studies such as (Dawood & Al-Batsh, 1983), (Brown & Leigh, 1986), (Posey et al., 1989) and (El-Rousan, 1996), and due to the proven problematic of IQ testing which resulted in classifying a significant proportion of the population as Intellectually disabled. A further major advantage of adaptive behavior assessments is that they provide data about actual behavior, whereas the results of intelligence tests are, generally speaking, relevant to potential behavior (Meyerset al., 1979).

There are many published adaptive behavior instruments that have been used for diagnosis, research, programme evaluation, administration, and individualized programming. Some of these scales were developed to serve only one of these purposes; however, several have attempted to include more than one purpose. Referring to the dual purpose of adaptive behavior scales, (Spreat, 1999) concluded that it is “unrealistic to think that the same test can be used for programme evaluation, diagnosis, classification, and individual programming”.

The process of construction an adaptive behaviour scale requires standardization and developing norms/norming if possible. Standardization is the process of developing a test that reliably and validly measures a specific dimension of behavior. It involves trying out items and analyzing them; revising or discarding those that don't work, adding items where there are gaps in difficulty, and reanalysis. Whereas, norming is the process of determining average scores for average people. Many scales are standardized, but few are normed because norming is an expensive process which usually means testing hundreds or thousands of carefully selected participants. Most norming samples of adaptive behaviour scales have been targeted at groups ages 3 to 18 or 21. This facilitates the early identification of preschool children at risk of intellectual disability and permits confirmation of persisting developmental delays.

Using an adaptive behaviour scale for assessing CWID is not easy process. One must consider not only general competencies across relevant domains but also the level, quality, and fluency of those behaviors. In addition, there is the issue of the ability to perform behaviors (i.e., can do) versus the actual performance of those skills (i.e., does do). In order for the assessment to be clinically and scientifically meaningful, it is important that the assessor be sufficiently trained in using and interpreting appropriate instruments. A high level of training is necessary in order to capture and distinguish the level, quality, and pattern of adaptive behavior displayed by a given subject, as viewed by the eyes of the respondent (parent, teacher, or caregiver).

There are many scales and checklists that were developed for assessing the adaptive behaviour of CWID in different countries of the world, and the domains and sub-domains that are included in these adaptive behaviour scales differ from one scale to another due to the diversity of environmental, cultural and lingual factors as well as the background of the researchers who developed these scales. The present study is an attempt to identify the common domains and sub-domains of the adaptive behaviour cross culture, environment and language as the adaptive behavior tests are not as culturally or ethnically bound as tests of intelligence (Hart & Risley, 1992; Sparrow et al., 1984a; Walker et al., 1994). This in turn will help the researches in the field of intellectual disability to identify the most important and common domains and sub-domains that are required to be kept in mind while developing

adaptive behaviour scales for CWID irrespective of the environmental variation as they are considered as basic and general needs for CWID wherever.

The present study, also, will through the light on the common methods that were adopted for establishing validity and reliability in the adaptive behaviour scales of CWID. This will help the researchers who are developing new adaptive behaviour scales or promoting the psychometric characteristics of existing adaptive behaviour scales to select the appropriate methods of validity and reliability for standardizing the adaptive behaviour scales of CWID.

Objective of the study:-

1. To identify the common structure of the adaptive behaviour scales of children with intellectual disability in terms of domains and sub-domains.
2. To identify the adopted methods of validity and reliability for standardizing the adaptive behaviour scales of children with intellectual disability.
3. To identify the factor structure of the adaptive behaviour scales of children with intellectual disability.

Methodology and procedures:-

The present study is an analytical study aims at identify the common structure, common adopted methods of validity and reliability and factor structure of the adaptive behaviour scales of children with intellectual disability.

In the present study, 30 scales and 52 studies relevant to the adaptive behaviour assessment of CWID were analyzed to attain the objectives of the study. The analyzed studies and adaptive behaviour scales were administered on samples of CWID in 15 countries of the world including USA, India, Jordan, New Zealand, Germany, Australia, Netherlands, UK, South Korea, Portugal, Switzerland, Belgium, Romania and Taiwan.

Qualitative analysis using triangulation analysis method was done for analyzing the content of the reviewed adaptive behaviour scales for the purpose of identifying the commonly apparent main domains and sub-domains of the adaptive behaviour scale as well as for identifying the models of factor structure of these scales.

Quantitative analysis using frequencies and percentages were used to find out the commonly used methods of validity and reliability that were adopted in all the reviewed and analyzed studies and scales of adaptive behaviour assessment of CWID.

Results:-

The objectives of the present study are given below separately followed by the results and interpretations of each one.

Objective No. 1:- To identify the common structure of the adaptive behaviour scales of children with intellectual disability in terms of domains and sub-domains.

To identify the common structure of the adaptive behaviour scales of CWID, 30 scales of adaptive behaviour were analyzed. Some of these assessment scales were developed to specifically assess one area of adaptive behaviour skills like academic skills, motor skills, social skills or mobility skills. However, majority of these scales were developed to assess different areas of adaptive behaviour skills. Table (1) clarifies the number and percentages of the scales assessing one area and scales assessing different areas of adaptive behaviour.

Table 1: Number and percentages of the scales assessing one area and scales assessing different areas of adaptive behavior.

S.N.	Area/Areas of Assessment	N	Percentage
1	One area of adaptive behaviour	5	17%
2	Various areas of adaptive behaviour	25	83%
Total		30	100%

The domains and sub-domains of the adaptive behaviour scales were listed out and triangulation analysis was conducted to find out the common domains and sub-domains of the adaptive behaviour assessment scales.

The results of triangulation analysis revealed 5 main domains and 19 sub-domains that need to be considered as common skills for developing the adaptive behaviour scales for CWID wherever irrespective of environmental and cultural factors. Table (2) explains the common domains and sub-domains of adaptive behaviour scales for CWID.

Table 2: Common domains and sub-domains of adaptive behaviour scales for CWID.

S.N.	Main Domains	Sub-domains
1	Daily living skills	Eating and drinking skills, bathing skills, brushing skills, dressing skills, toileting skills, community skills, domestic skills and family support skills
2	Communication skills	Receptive language and expressive language
3	Social skills	Interpersonal interaction and play and leisure time activities
4	Motor skills	Fine motor skills and gross motor skills
5	academic and conceptual skills	Reading, writing, numbers, time and money

The above domains and sub-domains mentioned in the table (2) addresses the common skills required for CWID as they are considered as general needs for CWID everywhere due to the influence of the intellectual disability. On other hand, the specificity of the environment and community to which the scale is going to be developed should be considered. In other words, the adaptive behaviour skills that are related to a particular community should be added while developing an adaptive behaviour scale for CWID, and the scale is not restricted to the above mentioned domains and sub-domains.

Objective No. 2: To identify the adopted methods of validity and reliability for standardizing the adaptive behaviour scales of children with intellectual disability.

To identify the adopted methods of validity and reliability of the adaptive behaviour scales of CWID, 41 studies were analyzed and the frequencies and percentages of the adopted methods of validity and reliability, in these studies, were calculated. The analyzed studies involved 12 studies examined the validity, 5 studies examined the reliability, and 24 studies examined both validity and reliability of different scales of adaptive behaviour.

Results and discussion related to validity:-

With regard to validity of the adaptive behaviour scales of CWID, 36 studies that examined the validity were analyzed and it was found that 8 methods of validity were used. Some studies used only one method of validity, whereas, other studies used more than one method of validity. The used methods of validity include construct validity, content validity, content and face validity, concurrent validity, discriminative validity, criterion validity, face validity and internal consistency. Table (3) describes the frequencies and percentages of the adopted methods of validity.

Table 3: Frequencies and percentages of the adopted methods of validity.

S.N.	Methods of validity	Frequency	Percentage
1	Construct validity	19	53%
2	Content validity	7	19%
3	Content and face validity	4	11%
4	Concurrent validity	13	36%
5	Discriminative validity	5	14%
6	Criterion validity	2	6%
7	Face validity	2	6%
8	Internal consistency	3	8%

It was found that construct validity (53%) and concurrent validity (36%) were the most used methods for establishing the validation in the analyzed adaptive behaviour scales. Construct validity was established in most of the studies by using factor analysis method, and in some other studies by correlating the performance on the adaptive behaviour scales with other scales or variables like achievement tests, intelligence tests, chronological age, cognitive functioning, or severity of the disability.

Concurrent validity was established by correlating the performance on the adaptive behaviour scales with other scales that measure similar content (adaptive behaviour skills) or by correlating the performance on the adaptive behaviour scales with other relevant scales or variables like Woodcock Johnson Psycho-Educational Test, Wechsler Intelligence Scale for Children-Revised (WISC-R), Stanford Binet Test, Reiss Screen for maladaptive Behaviour and classification of CWID.

It is observed that the method of correlating the performance on the adaptive behaviour assessment scales with other variable scales was named in some studies as construct validity, however, it was named as concurrent validity in other studies. For clarifying this conflict, in the context of the present study, the researchers thinks that when the correlation takes place between two scales both of them measure the same content, the name "concurrent validity" can be given for this method, but when two scales measure different content, this indicate to "construct validity".

Content validity method was used in 19% of the studies. Most of these studies used content validity on the basis of the representation of the content that intended to be assessed in the scale, whereas, the study of (Santos et al., 2014) established the content validity based on expert agreement about the scale. Content and face validity was used as one method in 11% of the studies, whereas, face validity was used as a separate method in 6% of the studies which express the viewpoint of some experts about the validity of the scale and does not reflect the real representation of the content. Other types of validity were scarcely used in some studies such as discriminative validity (14%), and criterion validity (6%). Internal consistency was, also, considered as a method of validity in 8% of the studies.

Results and discussion related to reliability:-

With regard to reliability of the adaptive behaviour scales of CWID, 29 studies that examined the reliability were analyzed and it was found that 6 methods of reliability were used. Some studies used only one method of reliability, whereas, other studies used more than one method of reliability. The used methods of reliability include test-retest reliability, internal consistency, split-half reliability, inter-rater reliability, interintereviewer reliability and rational equivalence. Table (4) describes the frequencies and percentages of the adopted methods of reliability.

Table 4: Frequencies and percentages of the adopted methods of reliability.

S.N.	Methods of Reliability	Frequency	Percentage
1	Test-retest reliability	18	62%
2	Internal consistency	13	45%
3	Split-half reliability	3	10%
4	Inter-rater reliability	14	48%
5	Interintereviewer reliability	1	3%
6	Rational equivalence	1	3%

It was found that three methods of reliability which are: test-retest reliability (62%), inter-rater reliability (48%) and internal consistency (45%) were the most commonly adopted methods for establishing reliability in the analyzed adaptive behaviour scales. This gives an indicator for the suitability and effectiveness of these three methods for establishing reliability while developing such scales of adaptive behaviour for CWID.

Some other types of reliability were scarcely used to examine the reliability of the adaptive behaviour scales which are split-half reliability 10%, interiterviewer reliability 03%, and rationale equivalence reliability 03% of the analyzed studies.

It should be noted that the American Association on Mental Retardation, Adaptive Behaviour Scale (AAMR, ABS) and Vineland Adaptive Behaviour Scale (VABS) may be considered the most effective adaptive behaviour scales for CWID. These two scales have typically been revised and updated in subsequent editions with enhanced psychometric characteristics and scoring. They may be considered, also, the most popular scales of adaptive behaviour as they were translated, adapted and standardized in many countries around the world. This can be attributed to the well construction and oldie of these two scales which considered from the oldest adaptive behaviour assessment scales for CWID in the 20th century. Five more scales were also seemed to be widely used e.i. Scales of Independent Behaviour-Revised (SIB-R), Adaptive Behaviour Assessment System- second edition (ABAS-II), Diagnostic Adaptive Behaviour Scale (DABS), Developmental Behaviour Checklist (DBC), and Behaviour Assessment System for Children- second edition (BASC-2).

Objective No. 3:- To identify the factor structure of the adaptive behaviour scales of children with intellectual disability.

To identify the factor structure of the adaptive behaviour scales of CWID, 10 studies that examined the variability of 5 adaptive behaviour scales were reviewed and analyzed. The analyzed scales include the American Association on Mental Retardation, Adaptive Behaviour Scale (AAMR, ABS), Diagnostic Adaptive Behaviour Scale (DABS), Scales of Independent Behaviour-Revised (SIB-R), Vineland Adaptive Behaviour Scale (VABS) and Developmental Behaviour Checklist (DBC).

The results of factor analysis in the analyzed studies revealed different models of variability for the adaptive behaviour scales of CWID, and the principal factors ranged from two to five factors. Table (5) explains the models of variability and principal factors of adaptive behaviour scales.

Table 5: Models of variability and principal factors of adaptive behaviour scales.

Models of Variability	Scale	Principal Factors
Two-factor model	AAMR, ABS	Personal independence and social behaviour
Three-factor model	AAMR, ABS	independent functioning, social mal-adaptation and personal mal-adaptation
	DABS	Conceptual, social and practical skills
	SIB-R	Basic living skills, social/cognitive engagement and physical environmental engagement
Four-factor model	VABS	Daily living skills, communication, socialization and motor skills
	AAMR, ABS	self competency, personal and social responsibility, physical development and socialization
Five-factor model	DBC	Disruptive/ antisocial, self-absorbed, communication disturbance, anxiety and social relating

It is observed that some similarities and more differences were found in the number and names of the principal factors produced by factor analysis in the reviewed studies, and the principal factors ranged from two to five factors. The differences in the number and names of produced principal factors of the adaptive behaviour scales can be attributed to administering the scales in different times and environments as well as to the differences in the construction of the adaptive behaviour scales.

It is also found that different principal factors were produced for AAMR, ABS in the reviewed studies which may be attributed to using this scale in different languages and countries (UAS, New Zealand and Jordan). Translation is a concern because the comparability of translations of items has seldom been confirmed through back-translation from the translated content to the initial language, or through confirmatory analysis through further retranslation (Craig & Tasse, 1999).

Discussion:-

Adaptive behaviour assessment has an integral role in the diagnostic process, classification and preparation of intervention programmes for CWID. Majority of the reviewed adaptive behaviour scales, in the present study, were developed to assess various areas of adaptive behaviour skills among CWID, whereas, only 17% of these scales were designed to specifically assess one area of adaptive behaviour skills such as academic skills (Narayan, 1997; Sudha, 2013), motor skills (Miller, 2006), social skills (Kolli, 2013) and mobility skills (Kvas et al., 2013). The results of triangulation analysis for the reviewed adaptive behaviour scales revealed 5 domains and 19 sub-domains of adaptive behaviour skills that need to be considered while developing any scale for assessing adaptive behaviour skills among CWID wherever irrespective of environmental and cultural factors. The common major domains include daily living skills, communication skills, social skills, motor skills, and academic and conceptual skills.

The analysis of the psychometric characteristics of the reviewed adaptive behaviour scales revealed that there are 8 methods of validity and 6 methods of reliability were used for standardizing the adaptive behaviour scales. Construct validity was the most used method for establishing validation in the adaptive behaviour scales, mostly, using factor analysis. In some studies, construct validity was established by correlating the performance on the adaptive

behaviour scales with other scales or variables like achievement test, intelligence tests, and age (Brown & Leigh, 1986), chronological age and cognitive ability (Bruininks et al., 1996), cognitive functioning and severity of disability (Wells et al., 2009), however, (Rosenblum,, 2006) determined the construct validity of his questionnaire by its ability to discriminate between children diagnosed with developmental coordination disorder and typically developing children. Concurrent validity was the second most used method. It was established by correlating the performance on the adaptive behaviour scales with other scales that measure similar content (Peshawaria et al., 2000; Brown & Hammill, 1990; Rosenblum,, 2006; Linde et al., 2013; Perry & Factor, 1989) or by correlating the performance on the adaptive behaviour scales with other relevant scales or variables like classification of CWID (Dawood and Al-Batsh, 1983), Woodcock Johnson Psycho-Educational Test and Wechsler Intelligence Scale for Children-Revised (WISC-R) (Posey et al., 1989), Stanford Binet Test and classification of CWID (El-Rousan, 1996), Reiss Screen for maladaptive Behaviour (Straccia et al., 2014). Content and face validity was used as one method in some studies (Jeyachandran & Vimala, 1972; Bruininks et al., 1996; Kolli, 2013; Rosenblum,, 2006), whereas, face validity was used as a separate method in the studies of (Peshawaria et al., 2000; Myreddi et al., 2004) which does not reflect the real representation of the content. Other types of validity were scarcely used in some studies such as discriminative validity (Reynolds & Kamphaus, 2004; Sudha, 2013; Einfeld & Tonge, 1995; Linde et al., 2013; Shenai & Dinaz 2014), and criterion validity (Narayan, 1997; Myreddi et al., 2004). Internal consistency was, also, considered as a method of validity in the studies of (Rosenblum, 2006) (Dawood & Al-Batsh, 1983) and (Dekker et al., 2002).

Three methods of reliability which are test-retest reliability, inter-rater reliability and internal consistency were found to be the most frequently used methods for establishing reliability in the adaptive behaviour scales. Three other methods of reliability were scarcely used which are split-half reliability (Bruininks et al., 1996; Myreddi et al., 2004; Shenai & Dinaz 2014). interiterviewer reliability (Sparrow et al., 2005) and rationale equivalence reliability (Sudha, 2013).

All the reviewed studies of factor analysis emphasized on the multidimensional structure of adaptive behaviour scales which ranged from two-factor model to five-factor model. This result support the result of (Meyers et al., 1979) which concluded from their review of factor analytic studies that adaptive behavior was definitely multidimensional and that the use of a total score would be inappropriate to indicate a general level of adaptation. The variation of adaptive behaviour scales or environments of administering the scales places different levels of emphasis on different adaptive behavior domains, and different methods of factor analysis can support different factor structures. Therefore, only one instrument, (DABS) examined by (Arias, 2013), produced a factor structure that included the three domains of adaptive behaviour (conceptual, social and practical skills) that are mentioned in the definition of intellectual disability as per American Association on Mental Retardation (2010). Using factor analysis approach was useful to determine the dimensional structure of the reviewed adaptive behaviour scales, but still this statistical method cannot determine whether some domains are missing and should be included.

Conclusion:-

In the present study, 30 scales and 52 studies related to adaptive behaviour assessment of CWID collected from 15 countries around the world and analyzed for the purpose of identifying the common structure and psychometric characteristics of the adaptive behaviour scales of CWID. The results of qualitative analysis using triangulation analysis revealed that the domains of daily living skills, communication skills, social skills, motor skills, and academic and conceptual skills are the main areas that should be considered while developing the scales of adaptive behaviour for CWID. The results of quantitative analysis using frequencies and percentages revealed that there are 8 methods of validity and 6 methods of reliability were adopted for standardizing the adaptive behaviour scales of CWID. The most commonly used methods of validity were the construct validity and concurrent validity, whereas, the methods of content validity, face validity, discriminative validity, criterion validity and internal consistency were scarcely used to establish validation in the adaptive behaviour scales. The most commonly used methods of reliability were the test-retest reliability, inter-rater reliability and internal consistency, whereas, other methods of reliability were scarcely used such as split-half reliability, interintereviewer reliability and rational equivalence. The results related to factor structure emphasized on the multidimensional structure of the adaptive behaviour scales of CWID which ranged from two-factor model to five-factor model. The researchers hope that the results of the present study will help the researchers who are going to develop new scales or promoting the existing scales of adaptive behaviour for CWID to understand the common structure of the adaptive behaviour assessment for CWID and select the appropriate methods of validity and reliability for standardizing their scales.

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