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MEASURING THE CONSTRUCT VALIDITY OF A SURVEY ON PARENTAL INVOLVEMENT TOENHANCE CHILDREN'S READING SKILLS: A RASCH MODEL ANALYSIS

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Abstract

This study aimed to assess the construct validity of a novel four-point Likert survey following Epstein's (1987) overlapping spheres of influence on parental engagement to enhance children's reading skills with the Rasch model analysis. Five constructs were identified with 56 items. A total of 34 parents completely addressed the distributed survey. The derived raw data were fed into the Statistical Package for Social Science (SPSS) Version 16 and assessed with WINSTEP software version 3.72 through item fit analysis, item and person separation index (item and person),reliability index (item and person), and unidimensionality. The item fit analysis revealed that several retained items required further optimization. The item and person separation index and item and person reliability index reflected values of 5 and 2 and .72 and .97, respectively. Meanwhile, aCronbach's alpha value of .97 was highlighted. Lastly, the unexplained variance in the first contrast denoted13.6% while theraw variance explained by measures was 53.8%.Conclusively, the aforementioned analyses implied the survey to havefair to excellent construct validity. This survey could be employed to gather the outcomes on parental engagement in preschoolers' reading.

Keywords: Construct validity; validity; reliability; survey; parental involvement in preschoolers' reading.

1. INTRODUCTION

Parents need to be aware of their engagement in children's literacy development (Epstein, 1987).As such, early literacy must be adequately planned for the success or failure of literacy skills (Ntim, 2015).Recent research has discovered the significance of parental involvement in facilitating early literacy skills (reading) development(Moss, 2016; Ntim, 2015; Kalb& Van Ours, 2012), which could be attained with parental participation in home-based reading activities. Overall, the empirical findings assert the essentiality of parental engagement in children's reading development.

The mediation of more knowledgeable others (MKO) proves crucial as an agent of children's educational success following Vygotsky (1978). Specifically, parents who are aware of children's academic performance and could adjust their support level to facilitate their learning process denote the best MKOs who could effectively scaffold their children. Following past research, parental involvement substantially catalyses the development of early literacy skills, such as reading (Moss, 2016; Ntim, 2015; Kolb & Van Ours, 2012).Bronfenbrenner's (1979)ecological theory implies how parents(as a system)potentially impact their children's learning and indicates the micro system to be

the contextin which individuals (preschoolers) spend most of their time with others, such as parents. Unsurprisingly, children engage insubstantial parent-child interactions. Children with exposure to life experiences tend to become successful learners. Furthermore, the mesosystem encompassing microsystem connections, such as those between school and home, proposesan in-class-at-home link for successful learning.

The essentiality of parental involvement in reading is reflected in Epstein's (1987)study, which developed the overlapping spheres of influence. A total of six parental involvement types have been identified. The first type involves parents' provision of home learning to children. Epstein (2011) emphasized the importance of family norms and home exercises for high learning continuity. Parents could demonstrate their engagement at home by designating a learning corner for their children to studyor offering educational materials. The second type involves parent-teacher communication with active listening for both parties to derive children's academic performance at school and home.

The third type denotes volunteering, which involves parents and their extended family members' engagement with schools to resolve children's second language (L2) acquisition challenges. The fourth type entails learning at home and involves parenting skills to ensure the school-home learning continuity, such as conducting home-based educational activities with parents as collaborative and facilitative agents. The fifth type implies decision-making where educators are encouraged to collaborate with parental decisions to add value to their children's L2 acquisition. For example, parental engagement subsequently creates value and importance for children's successful learning. The sixth and final typeis communal collaboration where the societyisdirectly engagedin children's educational process through relevant services, resources, and partnerships for optimal school programmes, family practices, and learning and development.

Despite the practicality of Epstein's (1987)aforementioned concept in assessing parental engagement with specific constructs, the elements must be duly evaluatedfor construct validity. As the measure of non-operationally defined attributes or quality, Cronbach and Meehl (1955) asserted that construct validity measures the theoretical validity of a presumed meaning. Construct validity for an instrument could be assessed in multiple ways. For example, Mohamad Aziz (2018)proposed piloting the instrument for scholars to collect and analyze raw data and subsequently extract the construct validity measure for item optimization. Construct reliability also impacts construct validity. Muijs (2011)defined reliability as the degree to which test scores are free from measurement error while Jackson (2003)justified that reliability measures instrument stability or internal consistency for specific concept measurement.

Creswell (2002)presents multiple reliability types (test-retest, alternate forms, alternate forms and test-retest, internal consistency, and inter-rater)that relyon the number of times the instruments are administered and the number of information-providing individuals. Construct validity could be assessed with Rasch model analysis in line with Azrilah, MohdSaidfullahandAzami (2013). Specifically, themodel could assess internal data descriptions for significant construct validity measures. Meanwhile, Bond(2003) impliedthe Rasch model to parallel theitem response theory counterpart. Bothmodels fall underthe conventionsof rigorous and empirically-measuredtrue score models which proves relevant in social science disciplines.

The Raschmodel analysis ascertains the extent to which scale responses outline the necessary patterns in fulfilling the measured constructs, specifically for novel items that are yet to be assessed regarding construct accuracy. Additionally, CroasmunandOstrom (2011)affirmed that Likert scale points require instrument validity and reliability testing. Overall, the study items within the four-point Likert scale survey must be measured for construct validity given its novelty.

2. METHODOLOGY

The study survey was disseminated to 40 parents with preschool children withonly 34 counterparts completing the survey. Rural-area parents were selectedas the survey constituted a part of the research that examined samples from this context. Rural areas were chosen asparents hailing from remote regions lacked parental engagement in children's education following past studies(Fantuzzi-Chapman, 2012; Siti&Narimah, 2018; Norazman et al., 2005;Jacob & Ludwig, 2009; Cheng & Wu, 2017; Hemmerechts, Agirdag&Kavadias, 2016).

The study respondents were duly informed through preschool teachers, who were contacted a week prior to notifying interested parents. Two meeting sessions were arranged in the school halls of two distinctrural areas in Kota Tinggi; the hall of SekolahKebangsaan (SK) Sungai Telur and SK Felda Air Tawar 5. The first and second sessions wereattended by 20 parent search. The parents were initially briefed on the study survey andthe purpose of the meeting before signing the informed consent. Notably, the parents couldpose questions on any matter before addressing the survey. The researcher was present and facilitated the respondents when necessary. The survey was returned to the research post-completion.

The gathered survey data were keyed intoSPSS version 16 and subsequently analysedusing theRaschmodel withWINSTEP software version 3.72. This model was incorporated as Azrilah, MohdSaidfullahandAzami (2013) affirmedthis model to have internal data description evaluation capacitiesfor significant validity measures withfour analyses:item fit analysis (examines item polarity or the degree to whichthe items measure the target construct) and item measure (misbehaved item assessment);separation index for item and person (item separation categories items based on their difficulty while peopleseparategroup samples ability-wise);reliability index for item and person (item reliability analyses whether the samples could discriminate item difficulty while person reliability evaluatedwhether the items could discriminate sample competence);uni dimensionality, which proves that items share the same dimension, ensures the measuring of particular objectives, and measures the number of variations assessed by the measuring tool.

3. INSTRUMENT

The study instrument was adopted and adapted from Epstein's (1897) overlapping spheres of influence, which explains how parents could actively and meaningfully engage in their children's education. Six types of parental involvement have been identified: parenting, communicating, volunteering, learning at home, decision-making, and communal collaboration. Nevertheless, only five counterpartswere selected for this research as the sixth proved irrelevant to the study area.This notionreflected the fundamentals of instrument development, which guides the researcher towards obtaining overall parental involvement. As such, the researcher could explore parental involvement based onhome and school activities. This concept also enabled optimal home-school connections towards learning continuity.The aforementioned concept also optimised parental involvement,which is deemed crucial for children's successful reading skills development(Epstein, 1987). Following past research, parental engagement substantially facilitates the development of early literacy skills, such as early reading (Moss, 2016 &Ntim, 2015), which could provesuccessful when parents engage with their children'sreading activities at home. Vygotsky (1978, 1980) affirmedthe essentiality ofMKO (parents) for learning success.

3.1 Instrument Development

The structured study toolwas presented in the form of a four-point Likert scale survey with the omissionof a neutral point. The scale (ranging fromnever ever, never, sometimes, and frequently) was selectedasthe researcher intendedto assessparental opinions over their participation in children's reading skills. Notably, the researcher could obtainsuch

opinionsthrough neutral point elimination. FollowingBrown(2000) and Chomeya (2010), the exclusion of neutral points (even-numbered Likert scale) enabledrespondents to uphold a specificstance regarding their responses.The survey, selected as a tool to provide inter-correlational data,intendedto evaluateparents' involvement in preschoolers' reading development. Such correlations could prove the effectiveness of parental involvement onreading success or failure.The survey was developedin Bahasa Malaysia (BM) to accommodate the study respondents' preferences.As such, presenting the study items in BM proved pertinent to this group of people.

3.2 The Survey

The survey encompassed Parts 1 and 2. The following subtopics provide thorough elaborations.

Part 1: Demographic Data

Parents were asked to tick their responses on personal details(age, race, bond with the children, number of children, job, household income, and education level)and language (language used at home, English proficiency, ability in English-reading, and ability in phonetic English-reading)withinthe box provided in Part 1.

Part 2: Parental Involvement in Preschooler's Reading

Parental involvement in preschoolers' reading development was measured in Part 2. The constructs paralleled Epstein's (1987) overlapping sphere of influence with five out of the six parent involvement types taken into consideration: (A) parenting, (B) communicating, (C) volunteering, (D) learning at home, and (E) decision-making. A total of 56 items were developed for the five aforementioned constructs. Table 1 presents the constructs and items included inPart 2.

Table 1 *Constructs and Items for Part 2*

Subpart	Construct	Item Number	Total
(A)	Parenting	1 - 13	13
(B)	Communicating	14 - 28	14
(C)	Volunteering	29 - 40	12
(D)	Learning at home	41 – 48	8
(E)	Decision Making	49 – 56	8

A four-point Likert scale ranging between (1) strongly agree, (2) agree, (3) disagree, and (4) strongly disagree was employed in Part 2 for parents' responses(see Table 2).

Table 2 *4-point Likert Scale*

Agreement Level	Strongly Agree	Agree	Disagree	Strongly Disagree
Rating	1	2	3	4

4. DISCUSSIONS OF THE FINDINGS

The study findingswere discussed based onthe four analyses, such asitem fit (item fit [infit:MNSQ and ZSTD], measure, and polarity), separation index, reliability index, and the principle of component analysis (PCA) following past literature (Abdul Aziz, Jusoh, Omar, Amlus&Awang, 2014; Nor Hasnida, 2016; SitiMistina& Mira, 2016; Sharifah Nurulhuda, MohdFauzi&Iswah, 2018). The following subtopics thoroughly explain the study analyses and subsequent discussions.

4.1 Item Fit Analysis

Item fit analysis was performedto determine the logic and precisemeasurement underlyingevery developed item throughtwo analyses: item fit (infit:MNSQ and ZSTD), measure, and polarity. The following discussions provide the necessary elaborations.

(i) Item Fit

The acceptable value range of MNSQ and ZSTD implied $0.4<MNSQ<1.5$ and $-2<ZSTD<2$, respectively,followingLinacre (2002)while Fisher (2007)mentionedthe adequatevalue range of MNSQ and ZSTD to

be0.5<MNSQ<1.5 and -2<ZSTD<2, respectively.Table 3 outlinesthe item fit values. Perceivably, two items didnot fulfil the MNSQ requirement: C34 (1.66) and A7 (2.06) while one item didnot fulfil the ZSTD requirement: A7 (2.9).Overall, theitems were retained with specified modificationsdespite failing to fulfil the specifiedrequirement.

Table 3 *Item Fit*

ENTRY NUMBER	INFIT		ITEM
	(MNSQ)	(ZSTD)	
48	1.04	.2	D48
16	.82	-.5	B16
49	1.48	1.5	E49
42	1.41	1.3	D42
56	1.40	1.3	E56
29	1.42	1.3	C29
55	1.18	.7	E55
39	.76	-.8	C39
53	.60	-1.5	E53
37	1.13	.5	C37
38	.82	-.5	C38
15	.89	-.3	B15
33	1.54	1.6	C33
44	0.78	-.7	D44
17	1.01	.1	B17
14	.83	-.5	B14
41	.90	-.3	D41
43	.72	-.9	D43
54	.84	-.05	E54
26	1.33	1.1	B26
34	1.66	2.0	C34
35	.88	-.3	C35
40	1.15	.6	C40
52	.70	-1.0	E52
8	1.29	1.0	A8
9	1.43	1.4	A9
25	.91	-.2	B25
30	1.04	.2	C30
31	1.04	.2	C31
47	.86	-.4	D47
51	.53	-1.8	E51
7	2.06	2.9	A7
18	.70	-1.0	B18
27	1.25	.9	B27
50	.77	-.8	E50
22	.51	-2.0	B22
32	.95	-.1	C32
21	.80	-.7	B21
45	.92	-.2	D45
3	1.27	1.0	A3
46	.83	-.5	D46
36	.53	-1.9	C36
4	1.00	.1	A4
1	.86	-.4	A1
5	.85	-.5	A5
11	.81	-.6	A11
6	.87	-.4	A6
13	.85	-.5	A13
20	.68	-1.2	B20
28	.54	-2.0	B28
2	.77	-.8	A2
10	1.42	1.5	A10
12	.84	-.5	A12
19	.79	-.8	B19
24	.63	-1.5	B24
23	.42	-2.8	B23

(ii) Item Measure

Item measuredetermineswhethertwo items or more sharethe same subject matter. In other words, the items measure the same subject

matter albeitwith different wordings. Items with the same measure values must be omittedwith only one item retained. The item to be retained could be ascertainedby observinginfit (MNSQ and ZSTD) values.For example, an item with MNSQ and ZSTD valuescloseto 1 and 0, respectively, could be retained.Table 4 presentsthe item measure values as follows: C37 andC38 (.54), D41 andD43 (.28), C34, C35, andC49 (.12), A8 andA9 (.05), B18 andB27 (-.03), A1, A5, andA11 (-.65), A6 andA13 (-.71), B20 andB28 (-.71), A2 andA10 (-.71), and B19 andB24 (-.89). The survey items were retained as the expert reviewsof content validity measurement concededthe items to beoptimal for the survey despite not fulfilling the requirement. Overall, the researcher performedspecified modifications to integratethe findings between expert ratings and item measure analysis.

Table 4 *Item Measure*

ENTRY NUMBER	MEASURE	ITEM
48	1.20	D48
16	1.00	B16
49	1.00	E49
42	.90	D42
56	.81	E56
29	.71	C29
55	.71	E55
39	.62	C39
53	.62	E53
37	.54	C37
38	.54	C38
15	.45	B15
33	.45	C33
44	.45	D44
17	.37	B17
14	.28	B14
41	.28	D41
43	.28	D43
54	.20	E54
26	.12	B26
34	.12	C34
35	.12	C35
40	.12	C40
52	.12	E52
8	.05	A8
9	.05	A9
25	.05	B25
30	.05	C30
31	.05	C31
47	.05	D47
51	.05	E51
7	-.03	A7
18	-.03	B18
27	-.03	B27
50	-.03	E50
22	-.10	B22
32	-.10	C32
21	-.25	B21
45	-.25	D45
3	-.32	A3
46	-.32	D46
36	-.38	C36
4	-.58	A4
1	-.65	A1
5	-.65	A5
11	-.65	A11
6	-.71	A6
13	-.71	A13
20	-.71	B20
28	-.71	B28
2	-.77	A2

10	-.77	A10
12	-.83	A12
19	-.89	B19
24	-.89	B24
23	-1.01	B23

(iii) Item Polarity

Item polarity analysis ensured the developed item isaligned with the study objectives. Following Fisher12, the point measure correlation values must be withinthe range of .32<PMC>0.8 and positive.Table 5 presents the item polarity analysis. Observably, no items exceeded the range with negative valuesand could be retained.

Table 5 *Item Polarity*

ENTRY NUMBER	PT-MEASURE CORR.	ITEM
48	.51	D48
16	.58	B16
49	.47	E49
42	.54	D42
56	.53	E56
29	.48	C29
55	.57	E55
39	.60	C39
53	.65	E53
37	.50	C37
38	.57	C38
15	.59	B15
33	.50	C33
44	.66	D44
17	.61	B17
14	.60	B14
41	.63	D41
43	.68	D43
54	.67	E54
26	.57	B26
34	.52	C34
35	.66	C35
40	.58	C40
52	.67	E52
8	.60	A8
9	.56	A9
25	.63	B25
30	.64	C30
31	.64	C31
47	.68	D47
51	.70	E51
7	.53	A7
18	.68	B18
27	.57	B27
50	.66	E50
22	.72	B22
32	.66	C32
21	.69	B21
45	.69	D45
3	.63	A3
46	.70	D46
36	.74	C36
4	.66	A4
1	.68	A1
5	.69	A5
11	.69	A11
6	.69	A6
13	.69	A13
20	.69	B20
28	.71	B28
2	.70	A2
10	.60	A10
12	.70	A12

19	.70	B19
24	.70	B24
23	.76	B23

4.2 Separation Index Analysis

Separation index analysis implies the distribution of all the persons or items along a continuum line based on agreeable factors with information on how the number of ability-oriented(person) and difficulty-based (item) groups are established in an instrument. The acceptable (fair) value for this analysis reflected2 (Fisher, 2007). Table 6 outlines the analysis value. The person and item separation index analysis demonstrated values of 2 (fair) and 5(excellent), respectively, which is deemed optimal following Fisher (2007). In other words, the item could separate a person to 1.59 ≈ 2 levels of ability. Furthermore, the person could separate the item to 5.38 ≈ 5 levels of difficulty.

Table 6 *Separation Index Analysis*

Measure	Total	Separation
Item	56	1.59 (fair)
Person	34	5.38 (excellent)

4.3 Reliability Index Analysis

Reliability index analysis demonstrates the correlation between items in a test (Mimi, Nor Lisa &Kahirol, 2015).Specifically, high and low values indicated strong and weak relationships between the test items. Adequate alpha (α) values were identified in this analysis. Frankel andWallen (1996)denoted that α must rangebetween.70 and.99 while Kubiszyn and Borich (2000) implied that α must be between.80 and .90.Additionally, Fisher (2007)asserted.67 to be the starting value for fair reliability. Table 7 outlines the reliability index analysis values. The α value implied .98, which proved to be acceptable under Frankel and Wallen (1996) and Kubiszyn and Borich (2000). Meanwhile, person reliability and item reliability implied.97 (excellent)and.72 (fair), respectively, in line with Fisher (2007).

Table 7 *Reliability Index Analysis*

Analysis	Point
Cronbach's alpha	.98
Person Reliability	.97 (excellent)
Item Reliability	.72 (fair)

4.4 Unidimensionality

Based on theunidimensionality assumption,a set of items included in the test only entails one underpinningconstruct measurement (Alavi&Bordbar, 2017). Unidimensionality is performedto prove that the instrument items share the same dimension, ensure that the measuring items assessspecific objectives, and measure the number ofvariances being evaluatedby the measuring instrument.Azrilah et al. (2017)and AlaviandBordbar(2017)statedthat the unidimensionality of atest and its items could be measuredby the PCA of residuals. Parallel to Fisher (2007), the unexplained variance in the firstcontrast (1 to 5 PCA of residual)was<15 whilethe range of raw variance in data explained by measures was<50.Table 8presentsthe unidimensionality assumption for the entireconstruct. Observably, the unexplained variance in the first contrast was13.6, thus indicating all the items at13.6% (fair),which followedthe construct. Meanwhile, the raw variance explained by measures reflected53.8% (fair), which failed to follow the construct.

Table 8 *PCA of Residual for the Whole Construct*

Standardized Residual Variance	Eigenvalue Units	Empirical (%)	Modelled (%)
Raw variance Explained by measures		53.8 (fair)	51.6
Unexplained variance in 1st contrast	13.6 (fair)		

5. CONCLUSION

This study survey on parental engagementtoenhance their children's reading development was newlyestablished. All the items must be assessed for construct validity given their novelty. The construct validity in this study was measured withthe Raschmodel analysis. Table 9 presents asummary of the findings.

Table 9 *Summary of Findings*

Analyses	Findings		
Item Fit Analysis	Item fit:	Item measure:	Item polarity:
	Items C34 andA7 did not fulfil the MNSQ requirement Item A7 did not fulfil the ZSTD requirement.	Items C37 & C38, D41 & D43, C34, C35, & C49, A8 & A9, B18 & B27, A1, A5, & A11, A6 & A13, B20 & B28, A2 & A10, and B19 & B24 shared the same measuring values.	all items fulfilled the polarity requirement withno negative value.
Separation Index Analysis	Item separation: 1.59 (fair).	Person separation: 5.38 (excellent).	
Reliability Index Analysis	Item reliability: .72 (fair).	Person reliability: .97 (excellent).	Cronbach'salpha: .98
Unidimensionality	Unexplained variance in 1st contrast: 13.6 (fair)	Raw variance explained by measure: 53.8 (fair)	

Four analyses were performed for construct validity measurement(see Table 9).First, item fit analysisserved to evaluatethe logic and accurate measurement underpinningeach structured item. Although some of the items didnot fulfil Linacre's (2002) and Fisher's (2007)requirement of infit MNSQ and ZSTD, the items were duly modified for item improvisation and retained. Item measure was also conductedto ascertainwhich items measured the same subject. Several items were found to reflectthe same measuring values but retained due to item workability based on the six expert reviews for content validation. Lastly, item polarity analysis was conductedto examine the item alignment with the objectives. Notably, no items with negative values were identified.

Item and person separation index analyses were performedto assess person and item distribution along a continuum line based on the agreeable factors. Resultantly, person classifiedthe items into fivegroups difficulty-wisewhileitem categorisedthe person into twogroups ability-wise.Item and person reliability index analyses were conductedto analyse the item correlationsin a test. Based on the study analyses, a Cronbach'salpha value of .98 proved adequate following Frankel andWallen (1996) and KubiszynandBorich (2000). Furthermore, item and person reliability reflectedvalues of .97(excellent) and .72 (fair), respectively.

Unidimensionality analysis withPCA proved the unexplained variance in 1st contrast to be13.6. As such, all the items implied13.6% (fair),which followedthe construct while the raw variance explained by measures denoted53.8% (fair), which failed tofollow the construct. Summarily, all four analyses performed with the Raschmodel analysis proved the novel survey to have fromfair to excellent construct validity with no item omissions and specified item optimisation.

Overall, the surveycould be empirically utilised.

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