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The validity and reliability of quality improvement and accreditation system instrument in managing childcare center

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ABSTRACT

Quality improvement and accreditation system (QIAS) instrument was developed to determine the quality management practices level in childcare centers in Malaysia. This study was conducted in Kedah, Penang, and Kelantan to intricate the reliability and validity of the instrument. Exploratory factor analysis (EFA) and item reliability analysis have been used to measure the level of reliability and authenticity of the questionnaires. Further, inter-rater reliability (IRR) test was used to obtain expert confirmation of the reliability, validity and credibility of the instrument. All the seven constructs possessed high reliability index value between 0.87–0.92. Similarly, EFA analysis showed that there are seven dimensions exist in the QIAS instrument with factor loading ranged from 0.64–0.88. The findings also showed that the variance explained in the data is 64.46% with Eigenvalue more than 1. These results reflecting that all the item are accepted with a high verification. In addition, a very high reliability coefficient value, α=0.93 and inter-rater reliability of 91% indicated a high level of agreement and reliability among field evaluators. The results proved that this QIAS instrument had high validity and reliability and was capable to measure the quality management practices level in Malaysian childcare center.

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1. INTRODUCTION

Management is a critical element in all facets of any successful community to achieve the necessary objectives with the lowest cost of time, resources, and capital. No matter what kind of organization, whether it operates for profit or on a non-profit basis, productive and quality management is important [1]. Quality management may also shift the general priorities of a company and affect deeply the way individual workers function. Employees must be proactive, engage and enroll in educational and graduate education courses [2]. Research on the standard of childcare is highly important for clinicians and policy-makers, especially to improve early childhood care in the future [3]. Much has come out of the argument that the standard of childcare increases the cognitive and social growth of children [4]. In general, consistency in the treatment of children is known to have two dimensions – intrinsic quality (e.g., education, setting, teaching) and quality of procedures (e.g., workers – encounters with children).

Power in a factor is deemed inadequate to promote the general growth of infants, because children in low-income households very much benefit from better child care more than others. The early years in a child's life are found to be an important critical period in the development of a child. Studies have shown multiple evidence of the impact of children's overall development when they received positive learning

experiences during their growing years, such as literacy, numeracy and cognitive development skills [5], [6] increases IQ scores and cultivates more positive interaction with peers [7]. Hence, it is pertinent to ensure that all childcare centers provide the best services and meet the quality standards set by the government and the stakeholders involved. Malaysian childcare centers have boom in recent years. In 2000, it was estimated that there were 3.4 million children aged 0-6 years and this number would have increased by now [8]. Since then, a network of childcare centers has appeared: workplace childcare center, private childcare centers, government-sponsored childcare centers, non-governmental organization (NGO)-sponsored childcare centers, community-based childcare centers, and home-based childcare centers. The reason for the high demand for these childcare centers is that the high costs of living have driven Malaysian mothers to leave home to join the workforce to help finance their family needs. In 2013 the Malaysia workforce comprised 55% of women and these are mothers, single mothers and fresh graduates [8].

Currently, there have been issues raised concerning quality at childcare centers in Malaysia. The problems cover teaching and learning, management, health, nutrition, and safety. The Akta Taska 1984 and the Child Act 2001 have laid the procedure and implementation of the childcare centers. All childcare providers (TASKA) and preschool teachers (TADIKA) have to undergo proper courses to ensure they are trained in early childcare [9]. This case includes short courses that enhance participants on the various developmental stages of the child, convention on the rights of the child (CRC), and the personal aspects of the providers. The objective of these courses is to ensure the childcare centers and preschools are properly run by qualified staff and, most importantly, the children in the centers are nurtured to their fullest potential. However, how far are the childcare providers and preschool teachers implementing what they have learned into their daily practices? In addition, the operators and principals who run their childcare centers would consistently conduct in-house training to their staff so as to ensure the staffs are updated with current issues, policies and knowledge on children.

As the number of childcare centers increase in the country there is a concern as to whether these centers are well managed and implementing best practices. To ensure the centers provide the best practices, we must investigate to gauge the quality at the centers. One of the best approaches to quality performance is to use the Quality improvements and accreditation system (QIAS) [10]. QIAS with multiple techniques, strategies, and tools is the best management approach to identify quality management in early childcare centers. The QIAS in Australia is stated to be of better quality in structured child care systems than the ones reported in the USA and the United Kingdom [11]. The concept of holistic child is strongly connected to the consistency of relationships between others as set out in the QIAS Quality Practices Guide [12]. Seven attributes need to be emphasized to build a reliable childcare center that guarantees the appropriate and suitable upbringing, growth and development of children. The seven dimensions in QIAS are: i) Staff relationships with peers and children; ii) Partnerships with families; iii) Evaluation and programming; iv) Children's learning and experiences; v) Safety and protective care; vi) Nutrition, health and well-being; and vii) Quality of support management.

In this case, the QIAS items were revised to suit with the Malaysian culture. However, before this instrument was fully used, it went through several processes of construction and consolidation of the instrument to ensure that each item used was accurate and has a high value of validity and reliability of the instrument. Consequently, this research is centered on: i) Obtaining the reliability of QIAS instruments; ii) Acquiring the validity of the instrument; and iii) Identifying the inter-rater reliability test of the instrument.

2. RESEARCH METHOD

2.1. Sample and data collection

The study was designed and carried out in three of the Malaysian states, which were Kedah, Penang, and Kelantan. Given the COVID-19 pandemic issue that is still plaguing the country, the survey study design had resorted to using questionnaires through the google form application. After analyzing and identifying the respondents involved in this study, the researcher sent a Google Form link for them to answer. In the first stage of data collection, 150 questionnaires were collected back from three states of Malaysia.

2.2. Instrumentation

This study used QIAS as the main reference tool. This instrument assessed the quality of the process in the childcare center during their operation. The ratings of QIAS instrument starting from 1 (unsatisfactory) to 4 (high quality). On the next process, the average QIAS score of each quality area was taken into account. The QIAS instrument was adapted and revised to fit into the context of Malaysia culture [11].

The researcher analyzed all the items in terms of content and sentence structure so that it could be clearly understood by the respondents. During the pilot study it was discovered that respondents were less familiar with the original scale used: 1 for "unsatisfactory" to 4 "high quality". The respondents could not differentiate between "good quality and high quality" scale. Thus, it was decided that using the word

"satisfactory" in all the four scales would help the respondents to understand and respond better. Based on this feedback and analysis, the items which will cover the quality areas are presented in Table 1.

Table 1. Research instrument

Quality area	Code	Dimension	No. of item
QA1	SR	Staff relationships with peers and children	9
QA2	PF	Partnerships with families	4
QA3	PE	Evaluation and programming	6
QA4	CEL	Children's learning and experiences	11
QA5	PCS	Safety and protective care	6
QA6	HNW	Nutrition, health and well-being	7
QA7	MSQ	Quality of support management	5
		Total number of items	48

2.3. Exploratory factor analysis (EFA)

Exploratory factor analysis (EFA) is performed to deduct the items from a large questionnaire into a single construct. Usually is conducted in the early stage of the study to determine how many constructs rotated from those initial items [12]. Through EFA, each item will be rotated according to the method that has been set and then separated into components based on the suitability of an item [13]. EFA is also a way to help researchers in suggesting items that need to be improved after finding that the load factor does not reach the required level [14]. The low load factor gives the impression that the items do not contribute to the variable components and should be dropped from the actual instrument. In this study, EFA was generated using the principal components analysis (PCA) method, while each item was rotated through the Varimax with Kaiser Normalization approach. These two methods are pairs that are often used in most studies to obtain the arrangement of items according to the components that have been determined.

2.4. Reliability analysis

Once the EFA is implemented, the items must be grouped in each component that has been set. The next step is to check the reliability of each component formed in this instrument as a result of recommendations from the generated EFA. High reliability value is a license or permission for the researcher to use each item in the instrument to be translated in the actual study [15]. High reliability in an instrument helps to obtain more valid data in addition to the requirements of the objectives that have been set [16].

2.5. Inter-rater reliability analysis

Inter-rater reliability determines the magnitude of homogeneity exist in the scores rated by several observers. On that occasion, when all observers agree with certain statement or context, then inter-rater reliability is 1 (100%), on the other hand, if observers do not agree at all then inter-rater reliability is 0 (0%). Inter-rater reliability also can be calculated by considering the percent of agreement, less to more complex (Cohen's Kappa). However, this study had used only the percent agreement method as the requirements for Cohen's Kappa method were not met. From the literature review made, in general the inter-rater reliability value in excess of 75% is considered acceptable for most fields.

3. RESULTS

The original QIAS had 33 items from all seven quality fields. However, after being revised and adapted to the Malaysian context, seven quality areas were still maintained, but the number of items increased to 48. Thus, all the items had been used for EFA and reliability analysis and the findings are discussed in sub section.

3.1. Exploratory factor analysis for validity

EFA analysis was implemented on the 48 items with Varimax rotation solution. There were seven dimensions of QIAS: i) Staff relationships with peers and children; ii) Families' partnerships; iii) Evaluation and programming; iv) Children's learning and experiences; v) Safety and protective care; vi) Nutrition, health and well-being; and vii) Quality of support management. They were used to obtain the shape and structure for 48 QIAS items involved and subsequently generate a scree plot. Based on the study, there were a total of 150 respondents to be the sample of the study. Therefore, the load factor for each item specified in this study was as low as 0.5. This is parallel with the recommendation by Creswell [16], that the minimum level of load factor as low as 0.5 is appropriate when the total sample of the study is at least 120 people.

Based on the Bartlett's Test of Sphericity, the value of Kaiser-Mayer-Olkin of Sampling Adequacy (KMO) was 0.82. This value assumed that the generated EFA can proceed to the next step because the sample used was adequate. According to Yong and Pearce [17], when the KMO value reaches the minimum level of at least 0.6, the EFA process can proceed further. In other words, this KMO value reflects that the instrument used is very suitable for generating the EFA process in determining the suitability of the item and its components [16]. Furthermore, this test also showed significant values between study items where the value of X2=4933.60, df=1128, and at a significant level of p=0.00 (p<0.05). Table 2 shows the details of the Bartlett's Test of Sphericity and KMO test.

Table 2. Bartlett's test of sphericity and KMO value

Test		Result
KMO measure of sampling adequacy		0.82
Bartlett's test	Approx. Chi-square	4933.60
	Df	1128
	Sig.	0.00

Table 3 shows the EFA generation results for each item and component in this study instrument. Each item was sorted by coefficient value ranging from the highest load factor to the lowest. This arrangement was implemented to facilitate the decision-making process as well making it easy to be understood [18]. Meanwhile, the value of accumulated variance as a result of this EFA generation was 64.46%. This value was sufficient to determine the components of the study instrument because it had exceeded the minimum amount of 60% [13].

Table 3. EFA for study items

Quality area	Item	Component						
		1	2	3	4	5	6	7
QA 1	SR2	.76						
	SR3	.74						
	SR8	.73						
	SR4	.72						
	SR5	.72						
	SR1	.71						
	SR7	.71						
	SR9	.69						
	SR6	.68						
QA 2	PF4		.82					
	PF3		.81					
	PF1		.73					
	PF2		.72					
QA 3	PE3			.83				
	PE5			.78				
	PE1			.75				
	PE6			.74				
	PE2			.73				
	PE4			.70				
QA 4	CEL5				.88			
	CEL1				.79			
	CEL6				.76			
	CEL11				.73			
	CEL10				.73			
	CEL9				.73			
	CEL3				.71			
	CEL8				.67			
	CEL4				.65			
	CEL2				.65			
	CEL7				.65			
QA 5	PCS3					.82		
	PCS2					.79		
	PCS1					.74		
	PCS5					.74		
	PCS4					.73		
	PCS6					.73		

Table 3. EFA for study items (*continued*)

Quality area	Item	Component						
		1	2	3	4	5	6	7
QA 6	HNW4						.87	
	HNW6						.78	
	HNW7						.74	
	HNW3						.72	
	HNW1						.70	
	HNW5						.65	
	HNW2						.64	
QA 7	MSQ2							.83
	MSQ3							.82
	MSQ5							.80
	MSQ4							.78
	MSQ1							.77
Eigenvalue		11.83	4.78	3.71	3.46	2.68	2.60	1.90
Variance (%)		24.65	9.93	7.72	7.21	5.58	5.40	3.95
Accumulated (%)		24.65	34.58	42.31	49.52	55.10	60.50	64.46

Referring to Table 3, it was found that all items had exceeded the minimum value for the set load factor which was 0.5. This situation proved that none of the tested items in the instrument needed to be removed. Based on the Eigenvalue, it was found that all components recorded values at 1.90, which exceeds 1.0. The Eigenvalue is an indicator that determine the formation of the number of components that should be present in the actual study instrument [17]. In other words, all the components in this study should be maintained. Nevertheless, the accuracy of the formation of the components in this EFA generation can be determined by the plot scree method. The number of components can usually be determined easily through a small circle in the scree plot starting from the left until the last circle before it becomes horizontal. Figure 1 shows the EFA test scree plot based on Eigenvalue exceeding 1.0. The calculation of the components started from the first circle on the left to the seventh circle before it showed the horizontal line to the end of the circle on the right.

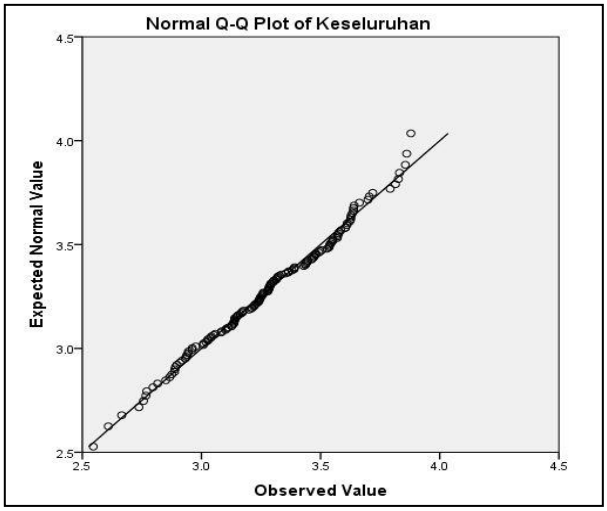

Figure 1. Scree plot based on eigenvalue exceeding 1.0

3.2. Item analysis for reliability

Once the EFA was implemented, the items were grouped in each component that had been set. The next step was to determine the reliability of each component formed in this instrument as a result of recommendations from EFA generation. Table 4 shows the reliability values of the components formed in the study instrument. In general, the Cronbach's alpha value (α) for the whole instrument was 0.93 which was at a very high level. In addition, the seven components formed also showed a very high α value, which was between 0.87 and 0.92.

Table 4. Reliability value of study instrument

Code	Components/Quality areas	No. of Item	Value
SR	Staff relationships with peers and children	9	0.89
PF	Partnerships with families	4	0.87
PE	Evaluation and programming	6	0.88
CEL	Children's learning and experiences	11	0.92
PCS	Safety and protective care	6	0.89
HNW	Nutrition, health, and well-being	7	0.89
MSQ	Quality of Support Management	5	0.90
	Overall	48	0.93

3.3. Normality test

Among the most important tests to determine data quality is the normality test. This test serves to determine whether each of the data collected has a normal shaped distribution properties [15]. Typically, data normality refers to two values namely skewness and kurtosis. According to Hair *et al*. [13], the study data are normally distributed when skewness and kurtosis values are in the range of +1.96 to -1.96. Based on the study data, it is found that all the components were at the level of data normality because the values of skewness and kurtosis were in the given range. This is clearly evidenced through Table 5.

Table 5. Normality test of study instrument

Code	Components	Skewness	Kurtosis
SR	Staff relationships with peers and children	-0.68	1.10
PF	Partnerships with families	-0.11	-0.13
PE	Evaluation and programming	-0.13	-0.09
CEL	Children's learning and experiences	-0.48	-0.29
PCS	Safety and protective care	-1.29	1.68
HNW	Nutrition, health, and well-being	-0.88	1.08
MSQ	Quality of Support Management	-0.35	-0.68
	Overall	-0.12	-0.47

In certain circumstances, the normality of the data can also be determined through the Normal Q-Q plot diagram. Items with data normality will be displayed through small circles approaching a predetermined 45 degree slope [15]. Simply put, the data is said to be not normally scattered if the small circle appears to be scattered in the Normal Q-Q plot diagram. Since the small circles were on average approaching the sloping line, it proved that the data in this study were normally scattered as presented in Figure 2.

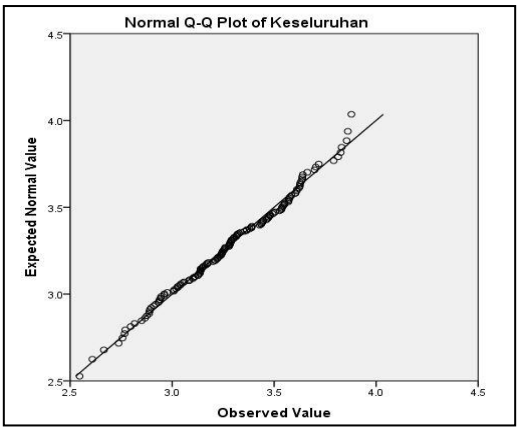

Figure 2. Normality test through normal Q-Q plot

3.4. Inter-Rater Reliability (IRR) analysis for instrument confirmation by experts

This research also explored the aspect of content validity, since it involved a qualified method to collect the qualified results. Content validity is necessary for quality studies since effective measurement requires quality [19]. Three specialists on early childhood education were interested in this research to measure the validity of the content.

Next, existing evidence that could be deemed credible had to be empirically checked. This is in accordance with Creswell [16] who explicitly indicated that during an observational evaluation and a research panel expert to verify questionnaires, the material validity index value can be extracted from proof. Since this study involved three states in Peninsular Malaysia namely Kedah, Penang and Kelantan, then expert verification was done by involving only three experts, of which one expert represented each state. The IRR calculations were made using the manual, as shown in Table 6.

Table 6. IRR calculations

	J1	J2	J3	J1/J2	J2/J3	J1/J3	Agreement
D1	4	4	4	1	1	1	3
D2	3	3	4	1	0	0	1
D3	4	4	4	1	1	1	3
D4	4	4	4	1	1	1	3
D5	4	4	4	1	1	1	3
D6	4	4	4	1	1	1	3
D7	4	4	4	1	1	1	3

$$Mean = \frac{(1/3 + 1/3 + 3/3 + 3/3 + 3/3 + 3/3 + 3/3)}{7} = 0.91$$

Findings showed that the inter-rater reliability (IRR) for this instrument was 91%. This means that there was 91% certainty of the test items showing the same results that are uniform repeatedly. It proved that the QIAS item was very reliable.

4. DICUSSION

The issue of quality in early childhood education and care (ECEC) has become a matter of significant concern in many countries in recent years [20]. One of the best approaches to quality performance is to use the QIAS. QIAS, with multiple strategies, techniques, and tools, is the best management approach to implement quality management in early childcare centers [21]. QIAS instruments are used to gauge childcare centers in Australia, and it has been reported that the Australia QIAS has a higher standard of quality informal childcare services than those reported for the US and UK [4], [10]. Therefore, they will use these instruments to identify quality management practices and develop quality assurance measurements in childcare centers in Malaysia. Thus, the QIAS instrument NCAC [10] was adapted to fit into the Malaysian context, and factor analysis is done in advance to ensure the validity and reliability of the instrument [9].

High values of reliability and validity indicate a high quality of research instrument. Whereas reliability indicates that instrument scores were stable and consistent [22]. The score should be consistent and nearly the same when a researcher runs the instrument many times at different times [23]. In order to achieve that level of quality, some analysis of the instrument must be done. Before the implementation of factor analysis, the data collected through a normalization phase. Normality testing is the earliest phase to ensure that each study data typically distributed. Normality tests also prove that the data obtained have a high degree of consistency [24].

Factor analysis is a statistical procedure used in order to identify and reduce a large number of questionnaire items into selected dimensions or constructs under a variable identified in the study. It is a technique of reducing data, which reduces items that overlap construct each other [25]. In factor analysis, the factor structure matrix gives the correlations between all observed variables and all extracted (latent) factors. When factors are orthogonally rotated, they remain uncorrelated, and the factor structure matrix will exactly match the factor pattern matrix [26]. Appropriate use of EFA necessitates thoughtful and informed researcher decision making. Therefore, EFA analysis was implemented on the 48 items of QIAS instruments with Varimax rotation solution.

In this study, it was found that all items had exceeded the minimum value for the set load factor which was 0.5. This situation proved that none of the tested items in the instrument needed to be removed. Based on the Eigenvalue, it was found that all components recorded values at 1.90, which exceeds 1.0. The Eigenvalue is an indicator that determine the formation of the number of components that should be present in the actual study instrument [16]. In other words, all the components in this study should be maintained and it can conclude that all items in the dimensions have a high degree [27]. Next, referring to the Bartlett's Test of Sphericity, the value of KMO was 0.82, which is means the sample size was appropriate. Analysis factors is suitable to use if KMO value is more than 0.70 [27], [28]. Meanwhile, the value of accumulated variance

of the EFA generation was 64.46%. It showed that these seven factors contributed 64.46% of the variance changes. This value was sufficient to determine the components of the study instrument because it had exceeded the minimum amount of 60% [14].

The second analysis is a reliability test. High reliability in an instrument helps researchers to obtain more valid data in addition to the requirements of the objectives that have been set [16]. Findings showed that the reliability values of the components formed in the study instrument. In general, the Cronbach's alpha value (α) for the whole instrument was 0.93 which was at a very high level. In addition, the seven components formed also showed a very high α value, which was between 0.87 and 0.92. The findings showed that the items have a very good and high reliability. This statement is based on Cooper and Schindler [29] which states that the value of Cronbach Alpha less than 0.60 is unacceptable, the value in the range of 0.60 to 0.80 is acceptable and that the value exceeding 0.80 is considered good. It also supports the statements of Chua [30] who also argue that the reliability index of less than 0.40 items is considered weak, 0.60 is good and over 0.80 is excellent.

Finally, inter-rater reliability (IRR) analysis was used for instrument confirmation by experts. The findings from the IRR test showed that the test item was very reliable, with the high percentage (91%). This means that there was 91% certainty of the test items showing the same results that are uniform repeatedly. Thus, this instrument has a superior level of reliability and credibility to be used in further studies to measure the quality management practices level in Malaysian childcare centers.

5. CONCLUSION

This research has successfully developed 48 items that can measure the quality management practices level in childcare center. Based on the results and discussion on the findings in this study, it can be concluded that the developed QIAS instrument was worthy and feasible. It showed that the test item was very reliable. This was proven by the results of the EFA analysis that seven quality areas with 48 items had met good instrument criteria, namely having good content validity and construct validity. The KMO value obtained indicates that this instrument has the suitability of the item along with its components. In addition, the inter-rater reliability value of 91% gave the impression that this instrument was very good and satisfactory, received confirmation and a high level of agreement among the experts involved. It was supported by the Cronbach's alpha value which was 0.93 for the entire instrument. So, this QIAS instrument has a high-reliability with an excellent internal consistency of measurement.

Therefore, it can be concluded that the QIAS instrument with adaptation and improvement to the items can be accepted as a tool to gauge the level of quality practices in Malaysian childcare centers. The decision maker should use the valid integrated instrument in the implementation of early childhood education to reliably assess the degree of quality control activities in childcare centers based on the comprehensive standards. Since this QIAS instrument has a high-reliability with an excellent validity instrument, so it is recommended to use as the best tools to measure the quality management practices in the childcare center. This instrument can also serve as a guideline in the development of integrated assessment instrument on other quality management practices.

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