International journal of child development and mental health
ISSN: 2286 - 7481; E-ISSN: 2586-887X *Vol. 6 No. 2 July – December 2018 (56-67)*

Validity and Reliability Study of the Indonesian Empathy Quotient–Systemizing /Quotient for Children (EQ–C/SQ–C)

Yudi Reza Phallaphi[1], Tjhin Wiguna[2], Eloisa Nathania[3,]
Kamila Ratu Chaidir[4], Kindah Mahdiyyah[5]
[1,2,3,4,5] Child and Adolescent Division, Department of Psychiatry
dr. Cipto Mangukusumo General Hospital – Faculty of Medicine Universitas Indonesia
*Corresponding Author: Tjhin Wiguna, email: tjin.wiguna@ui.ac.id

Received: 9 August 2018
Revised: 7 November 2018
Accepted: 6 December 2018

Abstract

Empathy and systemising skill are very important for strengthening pro-social behaviour. However, the EQ-C/SQ-C questionnaire was originally framed in the English language and has not been translated into the Indonesian language. Therefore, this study aims at validating and to analysing the reliability of the EQ-C/SQ-C in the Indonesian version. The study used a cross-sectional design that included 752 primary school students and their parents .They were selected randomly in accordance with their willingness to participate in the study. The parents were asked to fill the EQ-C/SQ-C questionnaire. The educational background of the parents was at least secondary high school. The analysis included content and construct validity, internal consistency reliability test. All analyses were run on SPSS for Mac version 21. The age of children ranged between 4–14 years, with mean (SD) being 10.07 (0.07). The educational background of parents was mostly above the high school degree. The content validity analysis showed that four statements of the EQ-C/SQ-C Indonesian version were not validated by the experts' judgment; therefore, they were deleted. The construct validation done after deleting 7 items of EQ-C and 6 items of SQ-C, the requirement for principle component analysis was accomplished. Principal component analysis of EQ-C/SQ-C items extracted three components with eigenvalue >1. These two components justified 64.39% of the total EQ-C/SQ-C variance. Internal consistency was good with Cronbach's alpha 0.979. EQ-C/SQ-C Indonesian version had a shorter version with 38 items. It was a valid and reliable questionnaire to measure the empathy and systemizing skills among Indonesian children.

Keywords: Primary school children, Validity, Reliability, Empathy quotient, Systemizing quotient, Indonesia

Introduction

Empathy is defined as the understanding of others' feelings and participating in an individual's emotional experiences without becoming the individual itself. Empathy is often analogous to "the ability to see the world through the eyes of others", or "putting yourself in the shoes of other people" (Keen, 2007). Among children, the skill of empathy is especially important to foster relationships, differentiate between right and wrong, maintain effective communication, and establish pro-social and altruistic behaviour (Pedersen, 2007; McDonald & Messinger, 2011). On the other hand, systemising skill is described as the

ability to analyse, explore and build a system of human relationships, which serves to predict the behavioural systems of others and design responses related to them (Auyeung et al., 2009). A very young child could show distress when hearing another child crying at the very beginning of their lives (Martin & Clark, 1982). Children at that period have already possess a basic emotional regulatory skill. They tend to be affected by other people's negative emotions and are able to comfort their own self to reduce the uncomfortable feeling (McDonald & Messinger, 2011). In the second year of life, the ability to differentiate between ourselves and other people expands and advances, as we not only start to look after ourselves but also others. At the age of 14–24 months, children already show a basic skill of empathy in the form of awareness towards their surroundings, hypothesis testing, and pro-social behaviours; although it is immature, it very important for their social development (Knafo, Zahn-Waxler, Van Hulle, Robinson, & Rhee, 2008). The empathy skill continues to develop as well as the ability to share and entertain other people, which can be performed by children age between 18–20 months. In the third year of life, a child could express an empathetic behaviour such as expressing concern through verbal and facial expressions, noticing difficulties experienced by others, and helping others. This development continues until the preschool period; at this period, children's language development improves significantly and they exercise their cognitive and emotional empathy abilities such as the capability to accurately imagine the experiences of others and represent others' emotional state. At this phase of development, they could identify people's conditions more accurately, thereby allowing them to help others with the help of more effective strategies (McDonald & Messinger, 2011). Theoretically, the focal point of empathy and systemising skill is the pre-motor part of the prefrontal and parietal cortex. It is regulated by a mirror neuron system (Iacoboni & Dapretto, 2006; Gallese, Rochat, Cossu, & Sinigaglia, 2009). Therefore, these systems are assumed to be the basis for connecting feelings or experiences with others. To be able to empathise, mirror neurons must communicate with other brain areas such as the limbic system that is involved in feeling and emotion. Each part of the limbic system processes different emotional stimuli, for example, the amygdale processes feelings of fear, while the anterior cingulate cortex processes feelings of contempt (Decety & Jackson, 2006; McDonald & Messinger, 2011). The above process also involves the temporal lobe and provides access to long-term memory that may be appropriate to the situation experienced (Preston & De Waal, 2001). Therefore, the parenting patterns also influence the development of empathy and systemising skills; parent-child interaction and synchronisation is very essential for children to gain those skills. Synchronisation is the process of matching behaviour between two related subjects. A previous study shows that synchronisation between a mother and her child in the first year of life has a direct association with the empathy skills among children and adolescents (Feldman, 2007; Auyeung et al., 2009). Children whose parents demonstrate more warmth are more likely to empathise with others. Consequently, parents who provide warmth, synchronisation, positive environment, and explain the causes and consequences of an emotion will most likely enhance the empathy and systemizing skills of their children (Garner, 2003; Auyeung et al., 2009). Baron-Cohen et al. (2002) explained that empathy and systemising 'brain type' could be assessed especially by appraising the ability to show empathy and perform systemising behaviours. The adult EQ/SQ questionnaire was a self-reported questionnaire in the Likert format and contain statements that include life situations, experiences, interests, expertise in empathy, analysis, and

investigation. Auyeung et al. (2009) adapted the EQ/SQ questionnaire by modifying the adult EQ/SQ questionnaire and changing the form of the EQ/SQ questionnaire into a parent rating and named it as EQ-C/SQ-C, especially, to prevent inaccuracies associated with children's ability to read and understand. A comparison of EQ and SQ scores of an individual with a standardised EQ and SQ score can determine the 'brain type' of the individual. The 'brain type' outline consists of extreme empathy (extreme E, the lowest scoring until 2.5th percentiles), better at empathy (type E, scoring between 2.5th–35th percentiles), balanced or balanced (type B, scoring between 35th–65th percentiles), better on systemising (type S, scoring between 65th–97.5th percentiles), and extreme systemising (extreme S, scoring above 97.5th percentiles). Auyeung also stated that questionnaire with five or more blank items are deemed unfinished and cannot be used (Auyeung et al., 2009). Lack of empathy and systemising skill among children results in incapability of behaving according to the prevailing social order in which he/she resides, which might affect him or her until adult life. Therefore, assessing empathy and systemising 'brain type' is very important, particularly, in the childhood period. Based on the above explanation, it is very important to frame the EQ-C/SQ-C questionnaire in the Indonesian language and fit into the Indonesian cultural background. Therefore, this study aimed at validating and analysing the reliability of the Indonesian version of EQ-C/SQ-C questionnaire; in addition, it was also trying to identify a shorter version of the Indonesian version of EQ-C/SQ-C that was still valid and reliable as compared to the original version. So, it can be disseminated throughout primary schools in Indonesia and based on national data on empathy among primary school students.

Objective

this study aimed at validating and analysing the reliability of the Indonesian version of EQ-C/SQ-C questionnaire. it was also trying to identify a shorter version of the Indonesian version of EQ-C/SQ-C that was still valid and reliable as compared to the original version.

Method

This was a validity and reliability study with a cross-sectional design. The research study included 752 primary school students and their parents who fulfilled the inclusion criteria: (1) primary school students between grade 1–6 and their parents; (2) parents should possess junior high school certificate as a minimum educational background; (3) and parents would like to participate in the research and fill the informed consent form. The exclusion criteria was parents not filling out the questionnaire completely (five items or more statements in the questionnaire left blank). The original EQ-C/SQ-C questionnaire consisted of 55 items and divided into two subgroups (Auyeung et al., 2009)

1.The EQ-C consisted of 27 items. EQ-C statements numbered 1, 6, 14, 18, 26, 28, 30, 31, 37, 42, 43, 45, 48, and 52 with 'slightly agree' response scores one point and 'definitely agree' scores two points. A response of 'slightly disagree' or 'definitely disagree' scores zero points. 'Slightly disagree' scores one point and 'definitely disagree' scores two points on the following statements: 2, 4, 7, 9, 13, 17, 20, 23, 33, 36, 40, 53, and 55. A response of 'slightly agree' or 'definitely agree' scores zero points.

2.The SQ-C was represented by 28 items. SQ-C statements numbered 5, 8, 10, 12, 19, 21, 24, 25, 29, 34, 35, 38, 39, 41, 44, 46, 49, and 50 with 'slightly agree' response scores one point and 'definitely agree' scores two points. A response of 'slightly disagree' or 'definitely disagree' scores zero points. 'Slightly disagree' scores one point and 'definitely disagree' scores two points on the following statements: 3, 11, 15, 16, 22, 27, 32, 47, 51, and 54.

A response of 'slightly agree' or 'definitely agree' scores zero points. The validity of EQ-C/SQ-C in the Indonesian version can be proven through the content validity, which used experts' assessment analysis, and construct validity using principle components analysis. In addition, the reliability is indicated by identical or similar measurement results when repeated measurements are performed. The strength of this study was greatly influenced by the reliability testing that included the internal consistency using Cronbach's alpha (Azwar, 2007; Pusponegoro, Wirya, Pudjiadi, Bisanto, & Zulkarnain, 2002).

The research began by contacting Bonnie Auyeung, a clinical psychologist belonging to the Autism Research Center, University of Cambridge, United Kingdom. The communication was conducted in the form of emails to obtain permission to adapt EQ-C/SQ-C into the Indonesian language and carry out the validity and reliability study. After receiving permission, the EQ-C/SQ-C questionnaire was translated by two anonymous English language and literature professionals without any medical background. During the translation process, no discussion took place between the two translators and the research team. Both the translations were discussed by the research team and modelled into one questionnaire. A pilot testing of the Indonesian version of the EQ-C/SQ-C was conducted among 10 parents of primary school students. The result of the pilot test was that the parents did not experience any significant difficulties in filling out the questionnaire. They also provided several suggestions, such as avoiding the use of several terms that were not easily understood, providing an example for each question, using branded goods that were familiar to the Indonesian population, using more precise and concrete words, and including the 'strongly agree' – 'strongly disagree' column on every page of the questionnaire. After several adjustments, the final version of the Indonesian EQ-C/SQ-C questionnaire was ready to be back translated into its original language. Another translator, who was different from the previous ones, carried out the back translation. The back translation version was sent back to Bonnie Auyeung and Anthony P.S. Guerrero (a Child and Adolescent Psychiatrist from Department of Psychiatry, University of Hawai'i, US. The latter was a native English speaker who confirmed the similarity of the content and context with the original version.

The validity and reliability analyses were conducted with the help of SPSS for Mac version 21. The Ethic Committee for Health Research at the Faculty of Medicine Universitas Indonesia approved the protocol of this study.

Results

Results of Content Validity Analysis

Content validity is obtained after selecting experts, identifying biased experts, and analysing expert assessment results (Aravamudhan & Krish naveni, 2015; Bujang & Baharum, 2017). Eleven experts participated in the content validity study (consisting of three child psychiatrists, four adult psychiatrists, and four senior psychiatric residents at the Department of Psychiatry Dr. Cipto Mangun kusumo General Hospital – Faculty of Medicine Universitas Indonesia, Jakarta). The identification of a biased expert is conducted by using Judges' Discrepancy from the Median (JDM) formula. The study used Roger's formula for checking the degree of approval of a biased expert (Rogers, 2010):

Note:

$$JDM_j = \sum_{k=1}^{k} \left| x_{kj} - Md_k \right|$$

- JDM: Judges' Discrepancy from the Median
- K: number of items on questionnaire
- J: judge (expert)
- Xkj: expert judgment j for item statement k
- Mdk: median for item statement k

The JDM details of each of the experts were

described in Table 1. This content validity analysis showed that there were two experts whose judgments were biased in relation to the EQ-C Indonesian version (expert number 3 and expert number 10) and one expert whose judgment (expert number 7) was biased in relation to the SQ-C Indonesian version. The bias might result from extreme expert judgments (either too low or too high), such as empty or rating 1 (irrelevant) on many items of the questionnaire. Further analysis of content validity involved expert assessment analysis using the descriptive data analysis (median), quantitative data analysis, content validity index/CVI, content validity coefficient/CVC, and content validity ratio/CVR). CVI is the percentage of experts who answer 'very relevant' or 'relevant'. CVI was divided into items-content validity index (I-CVI) and scales-content validity index (S-CVI) (Polit & Beck, 2006; Hellsten, 2008). The minimum value for I-CVI in this study was 0.78. Lynn (1986) determined that I-CVI was quite good if there were more than five appraisers present. These study consisted of 11 experts who acted as appraisers, so the value of I-CVI could be accepted.

CVC was calculated using the following formula (Aravamudhan & Krishnaveni, 2015):
Note:

$$CVC_k = \frac{S_k}{j(c-1)}; S_k = \sum_{j=1}^{j} x_{kj} - l_0$$

- CVC : Content Validity Coefficient
- K : questionnaire's items
- j : number of experts
- c : number of categories
- Xk j : expert judgment j for item statement k
- lo : the lowest validation category

By using the above formula, this study showed that the CVC of the Indonesian version of EQ-C was 0.74 (p = 0.036) and SQ-C was 0.73 (p = 0.032). Therefore, the content validity of the Indonesian version EQ-C/SQ-C was valid.

Table 1: Judges' Discrepancy from the Median from 11 experts

CVR was measured using the formula:

$$CVR_k = \frac{n_{ek} - \frac{N}{2}}{\frac{N}{2}}$$

'n_{ek}' is the number of experts who agreed that the item statement 'k' was relevant and 'N' is the sum of all the expert judgements. The expert judgement in this study was measured using a scale with the following categories: 'very relevant', 'relevant', 'rather relevant', and 'not relevant' (Aravamudhan & Krishnaveni, 2015). Based on the One Tailed Lawshe's table (Lawshe, 1975; Aiken, 1985), it was found that the minimum score of CVR was 0.78 from nine experts for EQ-C ($p < 0.05$) and 0.62 for 10 experts for SQ-C ($p < 0.05$). Based on the above analysis and the expert opinions, four statements were found to be not valid; it consisted of item number 17 and 23 for the EQ-C Indonesian version and item number 32 and 54 for SQ-C. Therefore, these four items were deleted (Table 2 and Table 3).

Table 1: Judges' Discrepancy from the Median from 11 experts

	JDM-EQ	JDP-EQ	JDM-SQ	JDP-SQ
1st expert	19	19	16	15
2nd expert	12	10	9	8
3rd expert	30	-	19	22
4th expert	11	9	7	9
5 th expert	12	12	7	10
6 th expert	11	11	13	14

	JDM-EQ	JDP-EQ	JDM-SQ	JDP-SQ
7 th expert	13	13	45	-
8 th expert	16	16	24	24
9 th expert	15	17	21	18
10 th expert	38	-	27	27
11 th expert	11	11	17	21

Table 2: Content validity analysis of the Indonesian version of EQ-C

EQ-C	1st expert	2nd expert	4th expert	5 h expert	6 h expert	7 h expert	8 h expert	9 h expert	11th expert	Median	CVI	CVC	CVR	Status
(1)	4	4	3	4	3	4	2	3	2	3	0.78	0.74	1	Retain
(2)	3	3	4	3	3	4	4	3	3	3	1	0.78	1	Retain
(4)	2	4	4	3	4	2	4	4	4	4	0.78	0.81	1	Retain
(6)	3	4	4	3	3	3	4	4	3	3	1	0.81	1	Retain
(7)	3	2	4	2	4	3	2	4	3	3	**0.67**	**0.67**	1	Retain
(9)	1	3	3	3	3	3	4	2	3	3	0.78	**0.59**	0.78	Retain
(13)	4	4	3	4	4	4	4	3	4	4	1	0.93	1	Retain
(14)	4	4	4	4	4	4	4	3	4	4	1	0.96	1	Retain
(17)	1	3	2	3	2	3	2	1	3	**2**	**0.44**	**0.41**	**0.56**	Deleted
(18)	3	4	3	4	2	4	4	4	3	4	0.89	0.81	1	Retain
(20)	2	4	4	3	4	4	4	4	3	4	0.89	0.85	1	Retain
(23)	1	3	2	3	2	2	4	1	4	**2**	**0.44**	**0.48**	**0.56**	Deleted
(26)	2	3	3	2	2	2	4	4	4	3	**0.56**	**0.63**	1	Retain
(28)	3	3	2	3	2	4	4	4	4	3	0.78	0.74	1	Retain
(30)	3	4	4	4	4	4	4	4	4	4	1	0.96	1	Retain
(31)	4	4	4	4	4	4	4	4	4	4	1	1	1	Retain
(33)	3	4	3	4	3	3	4	4	3	3	1	0.81	1	Retain
(36)	2	4	3	2	2	4	4	2	3	3	**0.56**	**0.63**	1	Retain
(37)	4	4	4	3	4	4	4	4	3	4	1	0.93	1	Retain
(40)	3	4	4	3	3	4	4	2	3	3	0.89	0.78	1	Retain
(42)	3	3	3	2	2	2	4	2	3	3	**0.56**	**0.56**	1	Retain
(43)	3	3	3	3	2	2	4	4	3	3	0.78	**0.67**	1	Retain
(45)	3	4	4	4	4	4	4	4	4	4	1	0.96	1	Retain
(48)	3	3	4	3	4	4	4	4	4	4	1	0.89	1	Retain
(52)	3	3	4	4	3	4	4	4	4	4	1	0.89	1	Retain
(53)	1	3	4	3	2	4	4	1	4	3	**0.67**	**0.63**	**0.56**	Retain
(55)	2	3	4	3	2	2	4	4	4	3	**0.67**	**0.7**	1	Retain

Table 3: Content validity analysis of the Indonesian version of SQ-C

SQ-C	1st expert	2nd expert	3rd expert	4th expert	5 th expert	6 th expert	8 th expert	9 th expert	10 th expert	11 th expert	Median	CVI	CVC	CVR	Status
(3)	3	3	3	3	3	-	4	2	2	3	3	0.78	**0.63**	0.78	Retain
(5)	4	4	2	4	3	4	4	-	4	2	4	0.78	0.81	0.78	Retain
(8)	4	3	1	4	3	3	4	1	4	3	3	0.8	**0.67**	**0.4**	Retain
(10)	4	3	3	4	3	3	4	1	4	2	3	0.8	**0.7**	**0.6**	Retain
(11)	3	3	4	3	3	4	4	2	2	2	3	**0.7**	**0.67**	0.8	Retain
(12)	3	3	2	3	4	4	4	3	4	3	3	0.9	0.77	0.8	Retain
(15)	3	3	3	3	2	2	4	2	4	2	3	**0.6**	**0.6**	0.8	Retain
(16)	3	3	3	3	2	3	4	3	1	2	3	**0.7**	**0.57**	**0.6**	Retain
(19)	4	3	4	3	3	3	4	4	4	2	3.5	0.9	0.8	0.8	Retain
(21)	3	3	4	3	3	3	4	3	4	2	3	0.9	0.73	0.8	Retain
(22)	4	3	3	2	2	3	4	3	4	3	3	0.8	**0.7**	0.8	Retain
(24)	3	3	3	3	3	3	4	4	4	4	3	1	0.8	0.8	Retain
(25)	2	3	4	3	3	3	4	3	4	3	3	0.9	0.73	0.8	Retain
(27)	3	3	1	3	2	3	4	3	4	2	3	**0.7**	**0.6**	**0.6**	Retain
(29)	4	4	3	3	3	3	4	4	4	3	3.5	1	0.83	0.8	Retain
(32)	3	4	1	2	2	3	4	3	1	2	**2.5**	**0.5**	**0.5**	**0.4**	Deleted
(34)	4	4	3	3	4	3	4	4	4	3	4	1	0.87	0.8	Retain
(35)	4	4	3	3	3	2	4	4	4	3	3.5	0.9	0.8	0.8	Retain
(38)	2	2	2	3	3	2	4	4	4	3	3	**0.6**	**0.63**	0.8	Retain
(39)	3	4	3	4	3	2	4	4	4	2	3.5	0.8	0.77	0.8	Retain
(41)	4	3	4	3	4	3	4	4	4	2	4	0.9	0.83	0.8	Retain
(44)	3	3	1	4	4	4	4	4	4	2	4	0.8	0.77	**0.6**	Retain
(46)	2	2	3	2	3	2	4	2	4	3	**2.5**	**0.5**	**0.57**	0.8	Retain
(47)	1	3	1	3	3	3	4	3	1	2	3	**0.6**	**0.47**	**0.4**	Retain
(49)	4	3	3	3	3	3	4	4	4	3	3	1	0.8	0.8	Retain
(50)	3	3	3	3	3	3	4	4	4	3	3	1	0.77	0.8	Retain
(51)	1	3	3	3	4	3	4	3	-	3	3	0.89	**0.67**	0.78	Retain
(54)	1	3	1	3	2	2	4	2	1	3	**2**	**0.4**	**0.4**	**0.4**	Deleted

Results of Construct Validity Analysis

Research Subjects Characteristics

A total of 752 primary school students and their parents participated in this study. The age of children who participated in this study had a mean (SD) of 10.07 (0.07), a median of 10 years, and fell within the range of 4–14 years. The gender ratio was quite equal, 44.3 % boys and 55.7% girls. The mean parent age ranged between 21–65 years. The major ethnicity was Javanese (36.7%), followed by Sundanese (33.6%), Betawinese (4%), and other ethnicities such as Bataknese, Minang and Ambonese. Most parents had a senior high school background (74%), and the rest had a

secondary high school background. Factor analysis was performed to identify groups or sets of variables/items that represented EQ-C/SQ-C in the Indonesian language. The purpose of the factor analysis in this study was to reduce the data set to a sufficient number. This is carried out so that the data set can be assessed as much as possible while retaining the original information obtained previously (Field, 2009). There were two results obtained from the principle components analysis (PCA), which was performed separately for EQ-C and SQ-C. The results were as follows:

1.PCA was performed on 25 items in the Indonesian version of the EQ-C with oblique rotation (Varimax). After deleting 5 items (item number 1, 6, 13, 28, and 48) of the Indonesian version of EQ-C, the study found the determinant of correlation matrix <0.0001, measures of sampling adequacy (MSA) > 0.5, and all items communalities > 0.5. In addition, the Kaiser-Meyer-Olkin (KMO) assay ensured the adequacy of the sample for analysis in this study (KMO = 0.972). Bartlett's test of sphericity was statistically significant (Value=10861.67, p <0.05). Therefore, all requirements for PCA further analysis were fulfilled. PCA extracted two components with eigenvalue > one. The first component justified 56.11% of variance and the second component was 6.76%. Both components explained 62.87% of variance. Items that were included in the first component was 2, 4, 7, 9, 14, 18, 20, 33, 36, 40, 53, and 55, which showed much more negative behaviour. The second component, on the other hand, consisted of item number 26, 30, 31, 37, 42, 43, 45, and 52, which expressed more positive behaviour.

2.PCA was performed on 26 items of the SQ-C Indonesian version with oblique rotation (Varimax). After deleting 6 items (item number 5, 11, 15, 19, 24, and 25) of the Indonesian version of SQ-C, the study found the determinant of correlation matrix <0.0001, measures of sampling adequacy (MSA) > 0.5, and all items communalities > 0.5. In addition, the Kaiser-Meyer-Olkin (KMO) assay ensured the adequacy of the sample for analysis in this study (KMO = 0.976). Bartlett's test of sphericity was statistically significant (Value=11209.63, p<0.05). Therefore, all requirements for PCA further analysis were fulfilled. PCA extracted two components with eigenvalue > 1. The first component justified 58.36% of variance and the second component was 5.91%. Both components explained 64.27% of variance. Items that were included in the first component was 3, 8, 10, 12, 16, 22, 27, 38, 46, 47, 49, 50, and 51, which showed much more generalised systemizing skills and flexibility. The second component, on the other hand, consisted of item numbers 21, 29, 34, 35, 39, 41, and 44, which showed much more mechanical and orderliness systemizing skills.

The final principle components analysis with oblique rotation (Varimax) was done with the 40 items of the Indonesian version of EQ-C/SQ-C. The first round of PCA, communalities analysis of item number 37 and 52 was less than 0.5 therefore it did not fulfil the prerequisite for further PCA interpretation, therefore both items was deleted. In the second round, PCA was done with 38 items of EQ-C/SQ-C. The second PCA analysis found the determinant of correlation matrix <0.0001, measures of sampling adequacy (MSA) > 0.5, and all items communalities > 0.5. In addition, the Kaiser-Meyer-Olkin (KMO) assay ensured the adequacy of the sample for analysis in this study (KMO = 0.983). Bartlett's test of sphericity was statistically significant (Value=24811.68, p<0.05). Therefore, all requirements for further PCA interpretation were fulfilled. PCA extracted three components with eigenvalue > 1. The first component justified 56.91% of variance, the second and third component was 4.84% and 2.65%. Both components explained 64.39% of variance (Table 4).

Table 4: Principle components analysis, rotated components matrix of the 38 items of Indonesian version EQ-C/SQ-C

		Components		
No.	Item description	1st	2nd	3rd
(55)	My child tends to resort to physical aggression to get what they want.	0.755	0.374	
(7)	My child enjoys cutting up worms or pulling the legs off insects.	0.753	0.344	
(8)	My child is interested in the different members of a specific animal category (e.g. dinosaurs, insects, etc).	0.739	0.356	
(33)	My child can seem so preoccupied with their own thoughts that they don't notice others getting bored.	0.721	0.318	
(36)	My child blames other children for things that they themselves have done.	0.714	0.429	
(53)	My child has been in trouble for name-calling or teasing.	0.712	0.406	
(10)	My child is interested in different types of vehicles (e.g. types of trains, cars, planes, etc).	0.712	0.359	
(20)	My child is often rude or impolite without realizing it.	0.708	0.435	
(14)	When playing with other children, my child spontaneously takes turns and shares toys.	0.674	0.395	0.338
(50)	My child enjoys events with organized routines (e.g. brownies, cubs, beavers, etc).	0.663		0.526
(22)	My child would not notice if something in the house had been moved or changed.	0.654	0.327	0.401
(16)	My child's bedroom is usually messy rather than organised.	0.652		0.449
(40)	My child sometimes pushes or pinches someone if they are annoying them.	0.652		0.559
(2)	My child often doesn't understand why some things upset other people so much.	0.647	0.302	0.416
(27)	My child would find it difficult to list their top 5 songs or films in order.	0.645	0.342	0.393
(12)	If they had to build a Lego or Meccano model, my child would follow an instruction sheet rather than "ploughing straight in".	0.637		0.496
(3)	My child doesn't mind if things in the house are not in their proper place.	0.633	0.324	0.344
(51)	My child is not bothered about knowing the exact timings of the day's plans.	0.618		0.487
(46)	My child likes to spend time mastering particular aspects of their favorite activities (e.g. skate-board or yo-yo tricks, football or ballet moves).	0.617		0.315
(4)	My child would not cry or get upset if a character in a film died.	0.613		0.436
(47)	My child finds using computers difficult.	0.609		0.513
(49)	If they had a sticker album, my child would not be satisfied until it was completed.	0.451	0.310	0.595
(18)	My child would enjoy looking after a pet.	0.449	0.353	0.472
(9)	My child has stolen something they wanted from their sibling or friend.	0.428	0.346	0.566
(38)	My child knows the differences between the latest models of games-consoles (e.g. X-box, Playstation, Playstation 2, etc) or other gadgets.	0.424		0.605
(34)	My child enjoys games that have strict rules (e.g. chess, dominos, etc).	0.398	0.486	0.420
(44)	My child likes to create lists of things (e.g. favorite toys, TV programs, etc).	0.370	0.460	0.532
(29)	My child quickly grasps patterns in numbers in math.	0.340	0.655	
(21)	My child knows how to mix paints to produce different colors.	0.332	0.593	0.361

Internal Consistency Reliability Test

Cronbach's alpha of the Indonesian version of EQ-C was 0.957 and 0.962 for SQ-C; however the 38 items of EQ-C/SQ-C Indonesian version assumed the internal consistency Cronbach's alpha was 0.979. The results showed that the Indonesian version of EQ-C/SQ-C had a good internal consistency (Cronbach's $\alpha > 0.9$, based on Hair, Black, Babin, & Anderson (2014) and Koo & Li (2016); Cronbach's $\alpha > 0.6$ was considered good for exploratory research).

Discussion

This study showed that four items did not fulfil the criteria for good content validity by the expert opinion: two items of EQ-C (item 17 and 23) and two items of SQ-C (item 32 and 54). These statements were considered as not relevant and

suggested to be deleted. The statement were as follows:

• Statement number 17 (EQ-C): My child may look stupid when giving his opinion, thus making others feel uncomfortable.

• Statement number 23 (EQ-C): My child has had problems due to physical bullying.

• Statement number 32 (SQ-C): My child is in no mood to understand how various machines work (i.e. cameras, traffic lights, TVs, and so on)

• Statement number 54 (SQ-C): My child will not enjoy brainteasers (Crossword puzzle, jigsaw, and searching for words).

The irrelevance of these four statements were likely due to the different concept of child rearing culture in Indonesia, which was in contrast to the original version of the EQ-C/SQ-C. The expert opinions mentioned that statement number 17 showed parents' negative perception towards their child, and usually parents in Indonesia would not openly express negative feelings and perceptions in relation to their children, especially as stupid or dump to others, because it also reflect their own weaknesses as parents respectively. In addition, statement number 23 was perceived as problems rooted in physical bullying, which was experienced by the child and did not have an exact correlation with empathy 'brain type'; therefore, the experts wondered whether this statement could significantly represent the child's brain type to empathise with others. Therefore, these two statements were identified as irrelevant for the EQ-C Indonesian version. In addition, statement number 32 and 54 for SQ-C were perceived irrelevant by most of the experts, because it was assumed that a child did not necessarily need to understand how a machine worked and play brainteaser game for gaining a system in human relationship even if it might represent the systemising 'brain type'; therefore, these two items were not as important as other items. The construct validity of the Indonesian version of EQ-C/SQ-C in this study was assessed through factor analysis. All items obtained from PCA had a positive correlation. Component correlation matrix also showed a good correlation between factors, so it can be concluded that EQ-C/SQ-C Indonesian version had shorter version with good construct validity. The Indonesian version of EQ-C/SQ-C possessed a good internal consistency. The Indonesian versions of EQ-C/SQ-C had a Cronbach's alpha of 0.957 for EQ-C, 0.962 for SQ-C and 0.979 for the total 38 items of EQ-c/SQ-C. Auyeung et al. (2009) found the Cronbach's alpha for EQ-C and SQ-C as 0.93 and 0.78 respectively. In addition, Groen, Fuermaier, Den Heijer, Tucha, & Althaus (2015), from The Netherlands, obtained Cronbach's alpha of 0.89 for EQ and 0.87 for SQ, but their research subjects were adults with autism spectrum disorder. The difference between internal consistency reliability in this study was likely due to differences in sample characteristics. The research subjects of this study were primary school students. Auyeung et al. (2009) and Groen et al. (2015) conducted their study among individuals with autism spectrum disorder. The study is the first study in Indonesia. The results is very good, therefore Indonesian versions of EQ-C/SQ-C can be disseminated and detect among earlier primary school students, who require specific education approach based on their empathy and systemizing 'brain type'. In addition, this was an important founder study that might trigger further study concerning the empathy, systemizing and balance 'brain type' among primary school students in Indonesia and developing a nationwide program on enhancing the capability of children's empathy. The only weakness of this study was the distribution of the questionnaire in Jakarta and surrounding areas only and not throughout Indonesia. Nevertheless, Jakarta is a multicultural city with a varied population; therefore, it could also represent Indonesia on a smaller scale. In conclusion, the Indonesian version of EQ-C/SQ-C has 38 items (18

statements for EQ-C and 20 statements for SQ-C). It is a valid and reliable questionnaire to quantify the 'brain type' among primary school children in Indonesia; and recommended to be used in a nationwide in order to reach a future better generation.

Acknowledges

Bonnie Auyeung and Anthony PS Guerrero's assistances and advices were very much appreciated. We also thanked for all students and parents that participated in this study. We would like to say thank you very much for the Faculty of Medicine Universitas Indonesia Research Grand that making this study finished on the right time.

References

Aiken, L. R. (1985). Three Coefficients for Analyzing the Reliability and Validity of Ratings. *Educational and Psychological Measurement, 45*(1), 131-142.

Aravamudhan, N. R., & Krishnaveni, R. (2015). Establishing and reporting content validity evidence of training and development capacity building scale (TDCBS). Management: *journal of contemporary management issues, 20*(1), 131-158.

Auyeung, B., Wheelwright, S., Allison, C., Atkinson, M., Samarawickrema, N., & Baron-Cohen, S. (2009). The Children's Empathy Quotient and Systemizing Quotient: Sex Differences in Typical Development and in Autism Spectrum Conditions. *Journal of Autism and Developmental Disorders, 39*(11), 1509-1521

Azwar, S. (2007). Validitas dan reliabilitas. Yogyakarta: *Pustaka Pelajar*, 44-6.

Baron-Cohen, S. (2002). The extreme male brain theory of autism. *Trends in Cognitive Sciences, 6*(6), 248-254.

Bujang, M. A., & Baharum, N. (2017). A simplified guide to determination of sample size requirements for estimating the value of intraclass correlation coefficient: a review. *Archives of Orofacial Science, 12*(1). 1 – 11.

Decety, J., & Jackson, P. L. (2006). A social -neuroscience perspective on empathy. *Current directions in psychological science, 15*(2), 54-58.

Feldman, R. (2007). Mother-infant synchrony and the development of moral orientation in childhood and adolescence: direct and indirect mechanisms of developmental continuity. *American Journal of Orthopsychiatry, 77*(4), 582.

Field, A. (2009). *Discovering statistics using SPSS. 3rd ed*. London, UK: Sage Publications Ltd.

Gallese, V., Rochat, M., Cossu, G., & Sinigaglia, C. (2009). Motor cognition and its role in the phylogeny and ontogeny of action understanding. *Developmental Psychology, 45*(1), 103-113.

Garner, P. W. (2003). Child and family correlates of toddlers' emotional and behavioral responses to a mishap. *Infant Mental Health Journal, 24*(6), 580-596.

Groen, Y. W., Fuermaier, A. B., Den Heijer, A. E., Tucha, O., & Althaus, M. (2015). The Empathy and Systemizing Quotient: The Psychometric Properties of the Dutch Version and a Review of the Cross-Cultural Stability. *Journal of Autism and Developmental Disorders, 45*(9), 2848-2864.

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate Data Analysis: Pearson New International Edition, Always Learning.* Harlow, UK: Pearson.

Hellsten, L. M. (2008, March). Accumulating content validity evidence: Assessing expert panel ratings of item relevance and representativeness. *In National Council on Measurement in Education Annual Conference, New York.*

Iacoboni, M., Dapretto, M. (2006). The mirror neuron system and the consequences of its dysfunction. *Nature Reviews Neuroscience, 7*(1), 942-951

Keen, S. (2007). *Empathy and the novel.* New York: Oxford University Press.

Knafo, A., Zahn-Waxler, C., Van Hulle, C., Robinson, J. L., & Rhee, S. H. (2008). The develop mental origins of a disposition toward empathy: Genetic and environmental contributions. *Emotion, 8*(6), 737-752.

Koo, T. K., & Li, M. Y. (2016). A Guideline of Selecting and Reporting Intraclass Correlation Coefficients for Reliability Research. *Journal of Chiropractic Medicine, 15*(2), 155-163.

Lawshe, C. H. (1975). A quantitative approach to content validity 1. *Personnel psychology, 28*(4), 563-575.

Lynn, M. R. (1986). Determination and Quantification Of Content Validity. *Nursing Research, 35*(6), 382-386.

Martin, G. B., & Clark, R. D. (1982). Distress crying in neonates: Species and peer specificity. *Developmental Psychology, 18*(1), 3-9.

McDonald, N. M., & Messinger, D. S. (2011). *In A. Acerbi, JA Lombo, & JJ Sanguineti (Eds), Free will, Emotions, and Moral Actions: Philosophy and Neuroscience in Dialogue*. IF-Press. In press.

Pedersen, R. (2007). Empathy: A wolf in sheep's clothing?. *Medicine Health Care and Philosophy, 11*(1), 325-335.

Polit, D. F., & Beck, C. T. (2006). The content validity index: are you sure you know what's being reported? Critique and recommendations. *Research in nursing & health, 29*(5), 489-497.

Preston, S. D., & De Waal, F. B. (2001). Empathy: Its ultimate and proximate bases. *Behavioral and Brain Sciences, 25*(01),1-72.

Pusponegoro, H. D., Wirya, I. G. N. W., Pudjiadi, A. H., Bisanto, J., & Zulkarnain, S. Z. (2002). *Uji diagnostik. Dasar-dasar metodologi penelitian klinis. 2nd ed.* Jakarta: Sagung Seto, 166-84.

Rogers, W. T. (2010): *Educational Psychology 507: The Nature of Validity.* Unpublished Manuscript, University of Alberta