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Assessment of Children's Toys Suitability Index Instrument (Toy Index)

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Abstract

The main purpose of this study is to produce a Toys Suitability Index Instrument (Toy Index) based on the assessment of the suitability level of children's toys aged three to five years old. This study employs the Fuzzy Delphi Method (FDM) and Analytical Hierarchical Processing (AHP) which are the 'Expert Polling' methods based on the integration analysis of the expert panels. The experts are from various backgrounds in terms of skills, experiences, and roles in the society. As a result, the findings have produced an instrument for the suitability of children's toys that consists of four (4) main indicators and 22 sub-indicators. Based on the findings, the 'Safety of Toys' indicator is the most important aspect that influenced the assessment of the Children's Toys Suitability with the value of LW=4.32/10 or 0.432/1. This is followed by the 'Values of Education' indicator with a reasonable value of LW=3.74/10 (0.374/1) and the 'Suitability of Playing' indicator with a value of LW=1.14/10(0.114/1). Meanwhile, the least important aspect is the Suitability of Information with the lowest value compared to the other aspects of children's toy suitability level with a value of LW= 0.75/10 (0.075/1). The Toy Index acts as a benchmark tool for designers or children's toy industries in producing quality and suitable products in Malaysia. This instrument may help Early Childhood educators in identifying appropriate toys for children's development.

Keywords: Instrument Assessment, Toy Index, children.

Introduction

In the 21st century, the development of industries in children's games is increasing. This is seen in line with the awareness of parents today on the importance of children's toys that are believed to have an impact on the children's future development. Apart from this, the importance of children's toys has been identified to have a significant effect on children's intellectual development such as in the fields of Astronomy, Science, Finance and others (Ramli, et al., 2022;

Vygotsky, 2004). This is also supported by Hedegaard (2016) who emphasized that toys are very important because they provide opportunities and space for children to be actively involved in imagining life.

However, in today's market attraction phenomenon, industries that produce children's toys focus more on profits and entertainment. In fact, designers of children's toys are also less concerned with the learning offered by these toys to children through cognitive activities such as exploration and problem-solving (Møller, 2016). Many studies have been conducted on the importance of the learning concept in the creation of children's toys. They discovered that most of the children's toys produced in the market are too high in structure, but less involvement of children in their imagination (Dauch, et al, 2018). Møller (2015) suggested that toys can be simple, but very useful to children's learning.

Apart from this, an important issue that should be given attention is monitoring the aspects of quality and safety of children's toys. Based on studies conducted on monitoring the quality of toys, revealed that the withdrawal of toys that cost almost one billion from the market worldwide was due to the excessive content level of lead as permitted (Bapuji, Beamish, Fellow, & Laplume, 2007; Weisberg, et al., 2013). Due to this, most countries in the world have various specific acts to protect children's safety and health because of their awareness of the importance of controlling the quality of children's toys products.

The products of children's toys in the market should be assessed in terms of their contributions or effects on children's development and learning, not only from the aspects of safety but also from cognitive, psychomotor and affective aspects. According to The European Commission, the enforcement of the act related to the safety features of toys is implemented by identifying the chemicals in the toys manufactured as well as the suitability of toys for different ages (Barroso, 2011).

In addition, in the United States, the Consumer Product Safety Commission (2022) has taken an effort by providing a guideline to parents and buyers on how to select toys based on the determining test procedures through the Code of Federal Regulations that are based on children age for each toy product manufactured. Other than the U.S., Turkey has also taken the initiative to introduce Toy Safety Regulations with Regulations 2017/30025 to determine whether toys produced are safe for children (Tsang, 2017).

In Malaysia, there are eight consumer-related acts enforced by the Ministry of Domestic Trade and Consumer Affairs (KPDNKK) including the Consumer Protection Act (APP) 1999 which is the main framework for consumer protection (Mat Said & Md. Yusoff, 2015). The safety regulations for children have been enacted under this act to ensure the safety of children's toys available in the market. However, the measurement tool to assess whether the toys reached the high marks in the Toy Index has yet to be developed in Malaysia.

Based on past studies, there are still no instruments or measuring instruments developed to determine the quality of toys to be produced or existing ones in the Malaysian market. Therefore, a study to produce the Toy Index is necessary as a benchmark for the production of high-quality toys. Due to this fact, this study aims to produce an index instrument to assess the suitability of toys for children three to five years old that acts as a benchmark tool for designers or children's toys industries in producing quality and safe products in Malaysia.

Methods

This study employs the Expert Polling method and is based on the integration analysis of the panel of experts' views. The experts consist of members from various backgrounds in terms of skills, experiences and roles in the society. The rationale for using this method is because the development of special indices especially in assessing the suitability level of children's toys, as in this study, involves specific elements or indicators and requires expertise in providing concrete feedback.

Panel of Experts Criteria

The views of 14 experts in terms of the consideration of specific and relevant factors will be considered; no personal views or perceptions will be accepted. In addition, the research questions selected to fulfil the research objectives are unsuitable to be randomly assigned to the public because they are developed for individuals who meet certain selection criteria. The selection criteria of the expert panels in this study are as follows:

i. have knowledge in the field/matter studied,
ii. have experiences in the field/matter studied,
iii. have commitments in terms of time and input throughout the workshop sessions from the beginning to the end, and
iv. have interests in the success of the study in line with the objectives developed.

Research Method

The research method involves two phases.

Phase 1 – Determination of the Children's Toy Index Suitability Constructs (Indicators and Sub-Indicators) for three to five years old

Phase 1 is conducted to fulfill the research objective which is identifying the elements of the Children's Toys Index suitable to be considered by the expert panels. This is done through the validation of the proposed instrument construct and obtaining the consensus of the expert panels on the elements that have been identified to develop a Suitability Toy Index instrument. The strengths and weaknesses of composite indicators are largely derived from the quality of policymakers (Nardo et al., 2005), therefore, the selection of indicators and sub-indicators for the suitability index of children's toys instrument is based on expert opinions and this is determined through the Fuzzy Delphi Method (FDM). This method is based on the theoretical framework and literature review before it is presented to the experts (Chu & Hwang, 2008).

The main goal of this phase is to identify the constructs (indicators and sub-indicators) of the suitability of the Children's Toys Index instrument. Since this study employs the Delphi Fuzzy method, the procedures involved in this phase are as follows:

1. Identify relevant indicators and sub-indicators based on experts' views.

The initial step is to identify relevant indicators and sub-indicators to be considered for the weighted assessment process in Phase 2. This step depends on input or views from a selected panel of experts. The selection process of experts for this study has been explained in the previous section. The panel of experts will be given recommendations on selected and classified indicators and sub-indicators based on the literature review. Then, the panel of experts will examine and discuss with each other whether to accept, reject, or restructure the indicators and sub-indicators.

Once the constructs proposed were agreed upon by the panel of experts, the final constructs were compiled in a form of a questionnaire. This is then distributed to the panel members to state their level of agreement on the constructs discussed, however, this time it is done personally. The level of agreement is stated based on the seven (7) levels of the Likert scale. The input from the experts on this scale was transformed into a linguistic scale to overcome the differences in views on 'Fuzziness'.

2. Determination of Fuzzy Scale

To address the issue of ambiguity or the differences in views among the experts, a linguistic scale was used for the purpose of formulating respondent feedback (Cheng & Lin 2002). The linguistic scale is similar to the Likert scale with the addition of 'fuzzy' numbering given to the response scale based on the Triangular Fuzzy Number as shown in Figure 1.

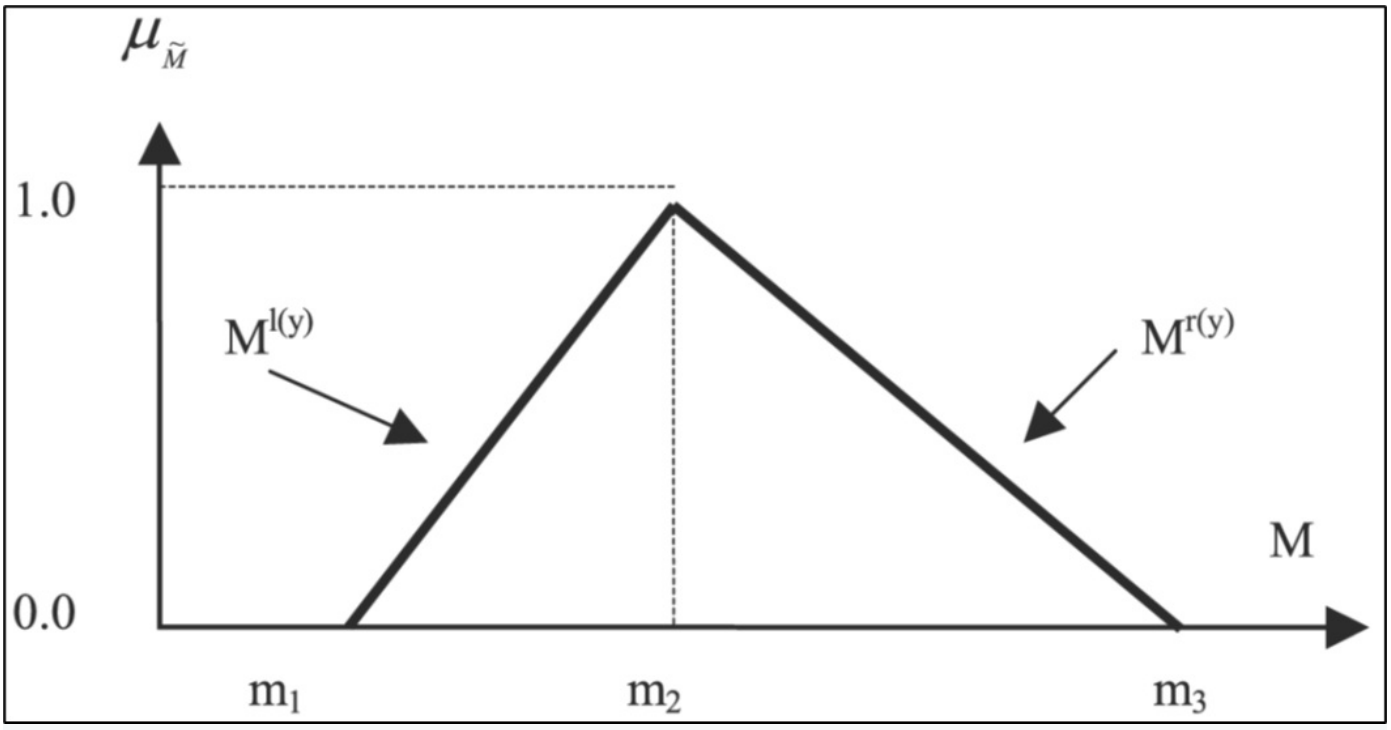

Figure 1. Triangular fuzzy number

m1= average minimum value (m1);

m2= the fairest average value; and

m3= average of maximum values

Phase 2 - Determination of the Fairness of Children's Toys Suitability Indicator for Toy Index

Phase 2 was conducted to obtain the weighted value for each construct on the suitability of the Children's Toys Index instrument through the integration of the expert panel's input. This phase employs the Analytical Hierarchy Process (Analytical Hierarchical Processing -AHP) method. This method is a critical decision-making tool. In fact, the Analytical Hierarchy Process (AHP) has been used as a method among decision-makers and researchers. Additionally, this method is one of the most frequently used critical decision-making tools. The combination of findings from Phase 1 and Phase 2 has resulted in the development of a children's toy suitability index instrument for children three to five years old.

Results and Discussions

Phase 1 – Determination of Constructs (Indicators and Sub-Indicators) for Children's Toy Suitability Index for three to five years old

Referring to the findings based on the value of 'De-fuzzy assessment', sub-indicators such as 'Enable hand-eye coordination activities' (A=0.993), 'Safe toy design (sharpness)' (A= 0.921), and 'Labeling of children's age' (A= 0.898) rank in the top three in assessing the suitability of children's toys. On the other hand, the sub-indicators such as 'Noises at a safe level' (A= 0.719), and 'The colour of products is not too much (attraction to children)' (A= 0.696) were at the lowest position as indicators to assess the suitability of children's toys.

However, a more important value to be considered in FDM analysis is the threshold value 'd' to determine the acceptance of sub-indicators in assessing the suitability of children's toys based on the views shared by the experts. Overall, all sub-indicators recorded a threshold value of 'd' less than or equal to 0.2, therefore, all sub-indicators were accepted as indicators to assess the suitability of children's toys as illustrated in Table 1.

Table 1. The outcome and positioning of children's toys suitability indicators and sub-indicators

No	Indicators	Sub-Indicators
1	Suitability of Information	Contain elements of cooperation and tolerance
		Include instructions/playing punctuation
		Labeling of children's age
2	Safety of Toy	Noises at a safe level
		The smell of products that does not affect the tastes of children
		The colour of products is not too much (attraction to children)
		Have a record of chemical testing/Chemical Test Certificate
		Have a test record (e.g., drop test, pull test, saliva)
		Non-hazardous game power source
		Safe toy design (sharpness)
3	Values of Education	Toys that help to develop emotional skills
		Help to develop children's self-esteem such as repeated elements – be successful
		Consist of simple problem-solving
		Consist of elements that help the development of abstract thinking
		Consist of elements to encourage focus
		Enable hand-eye coordination activities
		Consist of curiosity elements and can encourage children to talk and ask questions
		Consist of certain symbols to teach how to play
4	Suitability of Playing	Playing procedures from simple to difficult
		Allow children to repeat the imagination taken from playing (active play)
		Limit the game to a limited time (attention span)
		Flexible products – can be lifted and taken elsewhere

In conclusion, the Phase 1 study has produced appropriate indicators and sub-indicators to measure the level of children's toys suitability based on a combination of expert panel views. These indicators together with sub-indicators are the criteria used to measure the level of practice.

Phase 2 – Determination of Children's Toy Suitability Indicator for Toy Index

Phase 2 findings are divided into two parts.

Part 1: Determination of the main indicator values of children's toys suitability

In this section, in measuring the suitability of children's toys based on the literature review, it indicated that the measurement of the suitability level of children's toys should be considered of the weighting indicator factors in the measurement analysis. This is because practically, even if a phenomenon occurs with the influence of various aspects, there are aspects that are more dominant in their influences than others. The analysis of the indicators and their respective sub-indicators is conducted through the Analytical Hierarchical Process (AHP) method as discussed in the

methodology section of this report. Table 2 illustrates the findings of the experts in determining the indicators and sub-indicators. The overall consistency ratio, CR = 0.01 is less than 9%. This shows the findings have sufficient consistent values of experts and an accepted level of qualification.

Table 2. The main indicators of toys suitability for children three to five years old

No	Indicators	Local Weighted (LW)
1	Suitability of Information	0.080
2	Safety of toys	0.432
3	Values of Education	0.374
4	Suitability of Playing	0.114
	Total Ratio	1

Consistent Ratio, CR=0.01

Referring to Table 2, based on the approval of the expert panels, the ‘Safety of Toys' indicator is the most important aspect in influencing the measurement of the children’s toys suitability with the values of LW=4.32/10 or 0.432/1; CR=0.10, followed by an indicator (aspect) of the ‘Values of Education’ with the values of LW= 3.74/10 (0.374/1); CR=0.02 and ‘Suitability of Playing’ with values of LW= 1.14/10 (0.114/1; CR=0.04). While the 'Suitability of Information’ aspect although important, its weighting is the lowest compared to the other aspects of measuring the children’s toy suitability level with a value of LW= 0.75/10 (0.075/1). This indicates that, based on the expert panel’s views, in measuring the children’s toy suitability level, the ‘Safety of Toys’ and ‘Values of Education’ indicators are given greater priority distribution than other indicators.

In other words, selected toys should have safety features before other aspects are considered. The findings also show that even if a toy is selected for children's learning purposes, the educational value is only considered when the safety aspect is considered first. A more interesting thing is the aspects of details selected and this can be seen in the findings for the sub-indicators of each indicator (Table 3).

Therefore, through the AHP method, Table 3 shows the findings from the expert panels for more detailed features of each key indicator in the form of sub-indicators. The more important value in these findings is the overall value of each sub-indicator or named the ‘Global Weighted’ which will be used as the aggregate score coefficient of the expert views for each indicator of the children’s toy suitability to produce an index for each sub-indicator, indicator and finally the global index as a whole.

Table 3. Sub-indicators weighted of children’s toys suitability

No.	Indicators	Sub-Indicators	Weighted	
			Local Weighted (LW)	Global Weighted (GW)
1	Suitability of Information	Consist of cooperation and tolerance elements	0.430	0.0034
		Include playing instructions/punctuation	0.188	0.015
		Labeling of children's age	0.382	0.031
Total Ratio			1	
2	Safety of Toys	Noises at a safe level	0.073	0.032
		The smell of products that does not affect the tastes of children	0.077	0.033
		The colour of the product is not too much (attraction to children)	0.056	0.024
		Have a record of chemical testing/Chemical Test Certificate	0.175	0.076
		Have a test record (e.g. drop test, pull test, saliva)	0.139	0.060
		Non-hazardous toy power source	0.174	0.075
		Safe toy design (sharpness)	0.306	0.132
Total Ratio			1	
3	Values of Education	Toys that help to develop emotional skills	0.200	0.075
		Help to develop children's self-esteem such as repeated elements – be successful	0.171	0.064
		Consist of simple problem-solving	0.098	0.037
		Consist of elements that help the development of abstract thinking	0.080	0.030
		Consist of elements to encourage focus	0.113	0.042
		Enable hand-eye coordination activities	0.119	0.045
		Consist of curiosity elements and can encourage children to talk and ask questions	0.162	0.061
		Consist of certain symbols to teach how to play	0.059	0.022
Total Ratio			1	
4	Suitability of Playing	Playing procedures from simple to difficult	0.267	0.030
		Allow children to repeat the imagination taken from playing (active play)	0.389	0.044
		Limit the game to a limited time (attention span)	0.125	0.014
		Flexible products – can be lifted and taken elsewhere	0.218	0.025
Total Ratio			1	
Grand Total Ratio			4	1

As shown in Table 3, the experts unanimously select the 'Safety of Toys' indicator as the most important aspect that should be considered in measuring the children's toys suitability (LW= 0.432). Therefore, the next question is to focus on the details of this indicator: What is the most important thing to measure in the safety of toy aspect?

Table 3 clearly shows that under the aspect of 'Safety of Toys', the main sub-indicator is 'Safe toy Design (e.g.,

sharpness)' (LW=0.306; GW=0.132). The panel of experts has the opinion that for children aged three to five years old, the most important element to determine the toy's suitability is the shape of the toy. For example, does the toy have a sharp surface or is it small in size and harmful if the child accidentally swallows it?

The next priority level is followed by the 'Have a record of chemical testing/Chemical Test Certificate' indicator (LW=0.175; GW=0.076) and 'Non-hazardous toy power source' (LW=0.174; GW=0.075). These two sub-indicators have similar levels as the weighted valuation difference is only 0.001.

From these findings, it is obvious that the panel of experts collectively gave the highest weight to the design compared to the chemical test or power source of the toy. The lowest weighted rating in the aspect of 'Safety of Toy' is 'The colour of the product is not too much (attraction to children)' (LW=0.056; GW=0.024).

Referring to past studies, Schuman (2007) in his study outlined among the important aspects of choosing the right toys for children that the toys do not have toxic substances and are harmful to children's health, do not have the risk of electric shock to children and have accurate labeling for adult reference. He also stressed that toys especially for children between the ages of three and six should not contain small parts such as small balls, marbles, or balloons. This study supports Schuman's view of determining the aspects outlined based on priority.

On top of this, the experts suggested that the safety value of toys especially in terms of the shape (sharp or not containing small parts) should be prioritised first over other aspects such as not having the risk of electric shock (in this study- the power source of the toy) and not having toxic substances (in this study-having a chemical test record), in which each was given a second important priority after the safe design of the toy.

Meanwhile, accurate labeling for adult reference on toys (Schuman, 2007) is given the smallest weighting among other aspects of 'Include playing instructions/punctuation' with a global weighted of GW=0.015 or 'Labeling of children's age' with a global weighted of GW=0.382 under the main indicator of 'Suitability of Information' which is also given the lowest weighted of GW= 0.080 among the four main indicators.

Schuman (2007) also outlined that the selection of toys should be suitable to the cognitive development level of children. As discussed earlier, this view is confirmed in this study by setting the second priority to the 'Children Stimulus Development Value' or 'Values of Education' (GW=0.374) indicator. Although ranked second in the selection rating, the Values of Education of toys are the most scientifically studied and discussed in the faculty of early childhood developmental thinking.

This study further elaborates on this aspect by proposing important sub-indicators that are arranged according to their priority based on weighted value. Table 5 reveals that the sub-indicator/aspect of 'Toys that help to develop emotional skills' is given the highest value in the selection of children's toys in the aspect of ' Values of Education' with the global weighted of GW=0.075 (LW=0.2000). This is followed by the sub-indicator 'Help to develop children's self-esteem such as repeated elements – be successful' elements (LW=0.171; GW=0.064) and 'Consist of curiosity elements and can encourage children to talk and ask questions' (LW=0.162; GW=0.061). On the other hand, the lowest sub-indicator in the aspect of 'Values of Education' is 'Consist of certain symbols to teach how to play' with a rating of LW=0.059; GW=0.022.

Referring to the main purpose of this study, the instruments built are exclusive to be used by experts or experienced individuals in Early Childhood Education. This is because in determining the suitability of toys for a more comprehensive and accurate education and development of children, an instrument developed should include aspects beyond general perceptions or personal interests in toys. The aspects of the instrument should include elements that require respondents' views based on specific knowledge and experiences on Early Childhood Education. For example, an individual with no specific experience may be able to assess the suitability in terms of size, shape, and colour where perhaps the assessment will be influenced by the price of the toy; the suitability of the toy may be associated with an expensive price instead.

In other words, this *Toy Index* instrument is not suitable to be used by the general public who do not have the expertise; however, it is more suitable to be used by experts in the field. The heterogeneous group formed as a result of the general respondent selection characteristic conducted randomly was a factor in the assessment results of this group that were different and inconsistent compared to the groups of experts.

Conclusions

In meeting the needs of the Malaysian education sector to produce a benchmark for the production of quality toys, this study has produced a *Toy Index* instrument to assess the suitability of children's toys aged between three to five years old. Moreover, *the Toy Index* is a benchmark tool for designers or children's toy industries to produce quality and safe products, especially in Malaysia. This instrument also has the potential to help early childhood educators to choose suitable and valuable toys in educational programs.

Declaration of competing interest

The authors declare the following financial interests/personal relationships which may be considered as potential competing interests under the UPSI Special Research Grant ('Development of Toy Index for Children's Toy Testing', UPSI Reference Code: 2019-0224-106-011). The researchers would like to express their deepest appreciation and gratitude to UPSI who funded this research grant, all researchers, especially the Head of Research, Prof. Dr Saedah Siraj and those who are directly involved by spending their time and providing insights and input to complete this study.

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