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2 The Development of a Home Cognitive Stimulation Package for 2–3-Year-Old Children

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Abstract

The presented study aimed to develop a cognitive stimulation package for 2–3-year-old children and examine the effectiveness of the product in facilitating children's cognitive development at home. The study consisted of six phases, namely analysis, design, prototype development, formative evaluation, implementation, and summative evaluation. The analysis phase of this study involved 147 mothers and 3 experts. The participants in the formative evaluation phase consisted of 10 mothers, while the participants in the implementation and summative evaluation stages consisted of 20 mothers. The results of the experts' and target users' assessments suggest that the cognitive stimulation package developed in this study is valid and practical. In addition, the stimulation package has also been proven effective in facilitating the cognitive development of 2–3-year-old children at home.

Keywords: *cognitive stimulation, childcare, children's games*

Introduction

A number of studies have reported substantial contribution of the environment to children's cognitive development (Grantham-McGregor et al., 2007; Zheng, Rijdsdijk, & Arden, 2018). Family is closest to children. Parents, especially mothers, serve as the main actor who is responsible for children's care and protection at

home. Mc Coy et al. (2018) assert that it is important for parents to surround their children with adequate stimulation. If the stimulation process does not occur adequately, children's cognitive growth may be hindered. Consequently, children's potentials cannot develop optimally (Walker, Wachs, Gardner, Lozoff, et al., 2007).

The empirical proof has underlined the importance of cognitive stimulation at home, especially in facilitating children's cognitive development at their first three years of life. Therefore, a conceptual framework can be built based on the assumption that a home environment, which surrounds children during the first three years of their life, could affect the children's cognitive growth. Home environment which is closest to the children needs modification so that adequate stimulation can be provided to assist children in developing their cognitive ability. Mothers, who play a major role in childcare, are required to possess sufficient skills to conduct positive activities to stimulate their children's cognitive development. Likewise, the findings of Ambarwati, Yahya, & Sutanto (2015) suggest that exemplary parenting skills will help parents carry out their responsibilities accurately, which results in proper growth of potentials in children.

² Cognitive stimulation provided in early childhood should not be filled with mere knowledge, as in the case of adult education. Instead, children need to be given a lot of opportunities to explore their surrounding world through their senses so that they can recognize, distinguish, compare, and feel what lies in front of them or what exists in the environment. Accordingly, as summarized by Khadijah (2016), auditory, visual, kinesthetic, tactile, arithmetic, and geometric stimulation is imperative.

Interventions to the provision of cognitive stimuli for children need to be designed. Several efficacy tests and program evaluations have proven the benefits of home visiting strategies and/or center-based training, including efforts to improve mothers' skills and knowledge for children's development (Walker, 2010). Based on that, the presented study was intended to develop a ¹ cognitive stimulation package for 2–3-year-old children.

Research Methodology

The study was designed as a Research and Development study employing the Content Development Process (CDP). It was conducted at six stages, i.e., analysis, design, prototype development, formative evaluation, product implementation, and summative evaluation (Gustafson, 1981). The detailed design of the research is presented in Table 1.

Table 1. The phases and subjects of the research

Phase	Aim	Research Activities	Research Subject
Analysis	To analyze data	Distribute the questionnaire	147 mothers
Design	To generate a cognitive stimulation package	Perform theoretical and task analyses to determine the structure of the package, identify ideas for stimulation activities, materials/tools that are needed as well as methods to prepare the materials or carry out the activities	
Prototype Development	To produce an initial prototype of the package	Organize various ideas for stimulation activities and arrange them in the form of a package	
Formative Evaluation	To generate a valid prototype of the package	Invite experts to validate the package	3 experts
	To generate a practical prototype of the package	Conduct a test on target audience	10 mothers
Product Implementation	To try out the valid and practical package	Parents implemented stimulation activities in the package on their children	20 mothers
Summative Evaluation	To generate an effective cognitive stimulation package	Analyze the accomplishment of the target level of the children's cognitive development (before and after accepting the stimulation)	20 children

The participants in the analysis phase consisted of 147 mothers, who were selected in a purposive way. The formative evaluation phase involved 10 mothers, while the implementation phase involved 20 mothers, who were randomly selected from a group of mothers who had a 2–3-year-old child. The summative evaluation subject consisted of 20 children, who had received stimulation.

To answer the research problems, a questionnaire and a checklist were designed. The questionnaire contained 30 open-ended statements with four alternative answers, which referred to the theories and previous research findings related to children's cognitive development, such as Brooks, (2011); Khadijah (2016); and the Ministry of Education (2007). The questionnaire that was used to collect the experts' responses on the prototype consisted of 35 items. These items covered the

aspects of the development foundation, language, the appropriateness of the stimulation, children's cognitive development stages, and the characteristics or principles of the stimulation program. The questionnaire used to examine the validity of the checklist consisted of 4 items. These items helped the experts (validators) examine the clarity of the instructions, the conformity of cognitive development indicators with children's cognitive ability that was going to be evaluated, and the conformity of stimulation purposes with the activities. The target audience responses were collected using a questionnaire that elicited the readability, appeal, and clarity of the instructions, and the safety of the package used during the stimulation process. The checklist used consisted of indicators of the cognitive development of children aged 2–3 years (Ministry of Education, 2002).

The effectiveness of the package was evaluated through the difference found in the children's cognitive achievement. The difference was interpreted using N-gain analysis and then categorized into one of the following criteria: low ($0.00 < g < 0.30$); medium ($0.30 \leq g < 0.70$); high ($0.70 \leq g \leq 1$). The significance of the difference between the children's cognitive achievement before and after the intervention was examined through hypotheses testing and paired sample t-test analysis.

Research Findings

Needs Analysis for the Development of the Child's Cognitive Stimulation Package

The data collected show that the participants had a low awareness of what was needed to promote the child's cognitive development (66.67% were in the low category and 33.33% were in the high category). The findings related to the aspects of the child's cognitive development are presented in Table 2.

Table 2. Mothers' awareness of the aspects of cognitive development

	Auditory	Visual	Kinesthetic	Tactile	Arithmetic	Geometric
Mean	19.05	9.97	13.64	7.41	7.80	14.71
Median	19	10	13	7	7	14
Mode	18	10	12	6	7	15

The Description of the Child's Cognitive Stimulation Package

In the prototype development phase, two units were generated, a guidance book and a manual. The details of this two-unit package are shown in Table 3.

Table 3. The descriptions of the child's cognitive stimulation package

Unit	Components	Content
The Cognitive Stimulation Guidance Book	Rationale	The empirical proof of parents' role as the main supporter of their children's cognitive development
	Supporting theory	The explanations of children's cognitive development theories
	Benefits	The explanations of the activities in the package
	Impacts	An overview of the child's cognitive achievement
	Specifications	The explanations of the direction and scope of ideas in the package
	Strengths	Information on the strengths of the package
	Instructions	An overview of activities performed to accomplish the stimulation process
The Cognitive Stimulation Manual	Package 1	Each contains 11 stimulation activities
	Package 2	
	Package 3	

Validity and Practicality of the Child's Cognitive Stimulation Package

The results of the experts' validation and a test administered to the target users showed that the initial package prototype was very valid (3.41) and very practical (3.58). The findings on the validity and practicality of the initial package prototype are presented in Tables 4 and 5.

Table 4. The results of the validity test

No.	Aspect	Average	Criteria
1	The foundation of the product development	3.29	Very Valid
2	Language	3.33	Very Valid
3	The conformity of the package to the 2–3-year-old child's cognitive development needs	3.46	Very Valid
4	The conformity of the package to the 2–3-year-old child's cognitive development stages	3.43	Very Valid
5	The conformity of the package to the 2–3-year-old child's stimulation program characteristics	3.33	Very Valid

No.	Aspect	Average	Criteria
6	The conformity of the package to the principles of the 2–3-year-old child's stimulation program development	3.67	Very Valid
Total		3.41	Very Valid

Table 5. The results of the practicality test

No.	Aspect	Average	Criteria
1	The font size is proportional and visible	4.00	Very Practical
2	The font type is appropriate so the content is readable	4.00	Very Practical
3	The layout is in harmony	3.80	Very Practical
4	The color is well-selected and it helps clarify the content	3.40	Very Practical
5	The appearance is attractive	3.60	Very Practical
6	The sentences are understandable	3.30	Very Practical
7	It is easy to understand the methods of preparing the environment for play	3.40	Very Practical
8	It is easy to understand the methods of playing or the instructions to play	3.50	Very Practical
9	It is easy to prepare the environment for play	3.20	Practical
10	It is easy to provide the proposed stimulation	3.00	Practical
11	The materials/tools used are easy to find	4.00	Very Practical
12	The materials/tools used are safe for children	3.70	Very Practical
13	The stimulation is safe for children	3.70	Very Practical
Total		3.58	Very Practical

The Effectiveness of the Child's Cognitive Stimulation Package

The children's cognitive achievement after receiving cognitive stimulation from their mothers is presented in Table 6.

Table 6. The cognitive achievement of the 2–3-year-old children

Indicator	Data	Scores	Gain	N-Gain	Interpretation
Able to mention surrounding objects	Pretest	22.50	14.00	0.80	High
	Post-test	36.50			
Able to classify similar objects	Pretest	25.50	12.50	0.86	High
	Post-test	38.00			

Indicator	Data	Scores	Gain	N-Gain	Interpretation
Able to classify objects with circular shape	Pretest	25.50	12.00	0.83	High
	Post-test	37.50			
Able to classify objects with square shape	Pretest	23.50	13.50	0.82	High
	Post-test	37.00			
Able to differentiate sizes: big and small	Pretest	23.50	14.00	0.85	High
	Post-test	37.50			
Able to distinguish sounds	Pretest	23.50	12.50	0.76	High
	Post-test	36.00			
Able to distinguish flavors	Pretest	22.00	13.00	0.72	High
	Post-test	35.00			
Able to distinguish scents	Pretest	22.00	15.50	0.86	High
	Post-test	37.50			
Able to repeat/count numbers 1-5 (without recognizing the concept)	Pretest	22.50	13.50	0.77	High
	Post-test	36.00			
Able to classify at least 2 colors	Pretest	22.00	17.00	0.94	High
	Post-test	39.00			
Total	Pretest	232.50	137.50	0.82	High
	Post-test	370.00			

The effectiveness of the package in supporting the children’s cognitive development is presented in Table 7.

Table 7. The effectiveness of the stimulation package in supporting the 2–3-year-old children’s cognitive development

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Pretest – Posttest achievement of cognitive development	-6.8750	1.4037	.3139	-7.5320	-6.2180	-21.903	19	.000

Discussion

Needs for the Development of the Child's Cognitive Stimulation Package

A research finding presented in the earlier section has shown that there are a number of mothers who are not fully aware of their children's needs to develop their cognitive ability. Therefore, there is a chance that the children may receive minimum cognitive stimulation as they grow. This result is in line with that found by Grantham-McGregor et al. (2007), who stated that many children under five years of age in the developing countries were exposed to various risks that could affect their cognitive development. As stated by Balck et al. (2017), affordable activities that can be done at home, such as story-telling, singing, playing with the household stuff are able to provide children with experiences that encourage their early development stages. Similarly, Dauch, Imwalle, Ocasio, & Metz (2018) point out that parents need to pay attention to the following aspects of home environment: influences from individuals surrounding the children, sensory stimulation, objects, as well as the playground flexibility and safety.

Therefore, it is necessary to design an intervention to improve the mother-children interactions that can support children's cognitive development because in Indonesian contexts research in cognitive domain is mainly focused on adult learners (Sultan, Rofiuddin, Nurhadi, & Priyatni, 2017 & 2018). The intervention design can be formulated in a guidance book of children's cognitive stimulation. In accordance with this finding, Black et al. (2017) state that there is an urgent need to increase mothers' participation in children's early stages of learning.

The Characteristics of the Child's Cognitive Stimulation Package

The child's cognitive stimulation package for 2-3-year-old children developed in this study has several characteristics:

First, *stimulation is provided comprehensively*. The significance of this comprehensive stimulation has been outlined by Baker-Henningham & Boo (2010), who claim that the child's development is multidimensional; it covers the cognitive-language, sensory-motor, and socio-emotional domains, which are all dependent on each other. The substance of this characteristic is that each activity can stimulate more than one aspects of the child's development. This particular substance is illustrated in stimulation activities which are not oriented to the cognitive aspect only, but also to the combination of the sensory-motor activities that involve the child's motor skills and verbal interactions. The child's socio-emotional development.

Second, *stimulation is provided based on age*. Children entering this age group, according to Piaget, will encounter a conceptual thinking period or symbolic

thinking, which allows them to construct simple concepts; they begin to classify objects into a particular group based on their similarity. The essence of this characteristic is that each stimulation activity is developed based on the 2–3-year-old child's cognitive growth. The stimulation activities involve the use of the child's sense and concrete objects. The activities also encourage the child to participate directly in them, so the stimulation focuses more on the process. As a result, the child is given an opportunity to obtain real learning experiences through various games that can help him/her to explore, manipulate, and respond to stimuli from the environment in a constructive way. As the child learns to organize the information she/he has collected, she/he will be more able to classify objects into a particular group based on their similarity (Piaget & Inhelder, 1969).

Third, *stimulation involves the mother's interaction as the main support of the child's play activities*. Research findings that highlight the importance of the mother–child interaction in a stimulation process are reported by Jeon, Peterson, & DeCoster (2013), who proved that parents' support is very beneficial for toddlers (aged 14 months or more) to develop their cognitive ability. In addition, a study showed that a relationship built earlier by the mother is the main agent that can determine the child's growth, which as a result influences the child's cognitive achievement in the future (Zeman, Cassano, Perry-Parrish, & Stegall, 2006). The entity of this characteristic of stimulation has been designed to help mothers accompany their children to play so that the mother–child relationship can be established not only for the sake of the children's cognitive development, but also for their socio-emotional and physical-motor growth.

Fourth, *the stimulation package guides mothers to provide stimulation for their children*. The substance of this characteristic is that the stimulation package contains guidance for mothers as the target users to provide correct cognitive stimulation so that they are able to avoid errors that can harm the child's cognitive growth.

The Effectiveness of the Child's Cognitive Stimulation Package

The results of the N-gain analysis showed that there was a difference in the children's cognitive achievement after receiving stimulation from the package developed in this study (gain = 137.50). The gain scores of the children's cognitive achievement for all the indicators (n-gain = 0.82) were categorized as high $0.70 \leq g \leq 1$.

Statistical analysis of the effectiveness of the package showed t-calculated of 21.903 with sig. 0.0000, hence H_0 was rejected (sig. < 0.05). Thus, it can be concluded that there is a significant difference between the children's early cognitive

performance before the intervention and their cognitive achievement after receiving the intervention. In other words, the package has been proven effective in supporting the children's cognitive development.

According to these findings, it is obvious that the cognitive stimulation package developed in this study is effective in supporting the cognitive development of 2–3-year-old children at home. This effect is considered to result from the characteristics of the package that was designed comprehensively based on the characteristics of children aged 2–3 years. The comprehensiveness of the package also reflects the mother's role as the main supporter of her children's playing activities and as the main actor providing stimulation that does not limit children but allows them to pick their own toys and to receive compliments/awards/reinforcement.

The cognitive stimulation package developed in this study has been proven effective in supporting children's freedom to explore dominant parenting behaviors that are normally practiced in European and American families. Therefore, the stimulation package has potentials to be used widely to facilitate the cognitive development of children aged 2–3 years old at home.

Conclusions

¹ The home cognitive stimulation package for 2–3-year-old children developed in this study is valid according to the experts and the target users. Empirically, this package has been reported effective in facilitating 2–3-year-old children's cognitive development. This stimulation package contains practical steps that can guide mothers to provide their children with positive cognitive stimulation. Therefore, it is strongly recommended for mothers to apply this cognitive stimulation package at home.

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