

# Validity test of pre-screening developmental questionnaire (PDQ) and mother and child health (MCH) handbook for determining children's readiness to enter elementary school



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## ABSTRACT

**Introduction:** Many experts have tried to invent appropriate measures for deciding children's school readiness, one of which is the *Nijmeegse Schoolbekwaamheids Test* (NST). Unfortunately, it conveys several troubles such as being time-consuming, expensive, and uncomfortable for children. Meanwhile, the majority of parents have been accustomed to the pre-screening developmental questionnaire (PDQ) and mother and child health (MCH) handbook to monitor their children's development. The present study aimed to examine the PDQ and MCH handbook's validity for determining children's readiness to enter elementary school based on sensitivity, specificity, positive predictive value, and negative predictive value.

**Methods:** The study used a descriptive-observational research approach with a cross-sectional research design conducted from March to May 2022. Data were obtained from the completed PDQ, MCH handbook, and NST forms. The data were analyzed using the Chi-squared test to contrast the results of sensitivity, specificity, positive predictive value, and negative predictive value between variables to reveal whether the PDQ and MCH handbook were valid to be used besides the NST.

**Results:** There was a relationship between children's readiness to enter elementary school based on PDQ and NST ( $p < .05$ ) and the MCH handbook and NST ( $p < .05$ ). The sensitivity of children's readiness to enter elementary school based on PDQ was 96.2% with the specificity of 50%, the positive predictive value of 96.2%, and the negative predictive value of 50%. Moreover, the sensitivity of children's readiness to enter elementary school based on the MCH handbook was 80% with a specificity of 75%, a positive predictive value of 97.7%, and a negative predictive value of 23.1%.

**Conclusion:** The PDQ and MCH handbook can help Indonesian parents define their children's readiness to enter elementary school as it is more reachable and applicable.

**Keywords:** MCH handbook, NST, school readiness, PDQ.

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## INTRODUCTION

Parenting style might influence many aspects of children's physical and psychological development. Further, it determines children's affective and cognitive competencies where most people use them to conventionally consider the children's school readiness. The previous study explains that most parents in Indonesia are confronted with diverse obstacles in defining children's school readiness due to unsettled references.<sup>1</sup> Specifically, in coping with children's readiness to enter elementary school, Rahmawati (2018) conveys that parents often get some misconceptions in

deciding the standard reference for their children going to school.<sup>2</sup> This transitional stance from a fun-and-playful-based learning concept to a more-cognitive-emphasized learning mode is noteworthy to re-examine as the elementary school atmosphere challenges children with incalculable cognitive learning obstacles.<sup>3</sup> Therefore, parenting style in deciding children's school readiness is a substantial issue in succeeding children's physical and psychological development.

In addition, the previous study states that school readiness is often associated with a child's developmental age. Most schools use chronological age criteria in determining a child's readiness to learn.<sup>4,5</sup>

In Indonesia, conservative societies still use chronological age criteria to determine children's school readiness. They mostly get hereditary doctrines.<sup>6</sup> Their ancestors believed that cognitive development is quite settled at a certain age, so children can receive harder cognitive activities.<sup>7</sup> However, the previous study believes that cognitive competencies are not manifested in older ages.<sup>8</sup> Instead, it is more on personal experience in dealing with nearby environments, complex life problems, and a sense of sensitivity. The other study argued that age development does not guarantee a child has good cognition and is ready to accomplish more tasks.<sup>9</sup> Within the debates, many studies

found that age positively correlated with cognitive development. The Indonesian government has officially stated that children aged seven years are required to enter elementary school and pursue their twelve-year education regarding Indonesian Government Regulation 17 of 2010. Therefore, the theory of chronological age criteria remains controversial and still needs further justifications.

The measurement used to determine school readiness is varied by different perspectives. National Education Goals Panel shows its standard of school readiness with 5 dimensions: physical well-being and motor development, social and emotional development, approaches to learning, language development, and cognition and general knowledge.<sup>10</sup> The previous study show that a child's school readiness includes many aspects such as age-appropriate health and the ability to do a self-care, the ability to regulate emotions and behaviour, appropriate interaction with adults and children, effective communication in conveying needs and feelings, involvement with the surrounding environment, learning motivation, psychomotor competencies, cognitive knowledge, and the ability to adapt to classroom demands.<sup>11</sup> Additionally, Nurhayati (2018) explains that the development of health, social and emotional attainment, and a child's personality also play a significant role in determining school readiness. Therefore, various challenges in inventing sub-skills of the appropriate measures still get some constraints.<sup>1</sup>

For some arguable aspects of defining school readiness, *Nijmeegse Schoolbekwaamheid Test* (NST) is often used to measure a child's maturity in cognitive, motor, and social-emotional competencies to decide children's school readiness.<sup>1,12-15</sup> It consists of 10 sub-tests, with a test description that contains pictures as well as the answers, each of which reveals different abilities.<sup>12</sup> Each correct answer is scored 1 and 0 for incorrect ones.<sup>12,16,17</sup> During periods of time, NST is internationally used as a gold standard to determine children's readiness to enter elementary schools. The Indonesian government also uses it to determine whether a child is ready to

attend elementary school. In a different stance, it is more applicable as it deals with children in a golden era where they obviously experience a more persuasive and interesting method to approach.<sup>18</sup>

Unfortunately, the NST pertained in Indonesia remains controversial due to respective rationales. First, its implementation has only dispensed with a very limited scope of access. NST is a complex and expensive test so many Indonesian parents with diverse economic capacitation might have difficulties in obtaining the test. Moreover, it consumes lots of time and parents might require extra effort to complete the test. For conservative societies, it might not have signified their needs and abilities due to the multilayers of reasons covering different background knowledge, cultures, and accessibilities. Second, it is more psychologically uncomfortable for children to complete the test since the test examiners directly confront them. This situation creates another frightening scheme for children before they go to school. These two rationales are only simple causes of those many others to state the inflexibility of the test tool. Therefore, there must be a stance for alternatives that offer flexibility, surveillance, easiness, and comfort in administering the test or measures.<sup>19</sup>

By referring to the above phenomena, the novelty of the present study lies in how to maximize the use of the PDQ and MCH handbook owned by the majority of parents across regions in Indonesia. This optimization of usage would benefit lots of stakeholders including but not limited to the Indonesian government and parents. In regard to the national advantages, the Indonesian government will have a comfortable method in decreasing the number of student dropouts of elementary school due to cognitive shock or incapacitation. They also perceive easier techniques in maintaining the quality of their future human resources. In addition, Indonesian parents might be more autonomous in determining their children's school readiness by utilizing the PDQ and MCH handbooks, which are accessible to their nearby healthcare or midwife services. This novelty, namely the optimization of PDQ and MCH handbook,

would be a great troubleshooter for pre-screening children's school readiness so Indonesian parents have an easy technique to determine their children's readiness to enter elementary school.<sup>20</sup>

Suppose the use of the PDQ and MCH handbook is beneficial. In that case, the following challenge is to prove whether the two of them are valid in substituting the NST results in determining children's school readiness. Therefore, the present study aimed to examine the validity of the PDQ and MCH handbook in determining children's readiness to enter elementary school. The present study would portray how PDQ and MCH handbooks are able to be an alternative for Indonesian parents besides NST. The study would contrast PDQ, NST, and MCH handbook based on sensitivity, specificity, positive predictive value, and negative predictive value.

## METHODS

The study used a descriptive-observational research approach with a cross-sectional research design. The population of the study was the children who studied at ten kindergarten schools under the same foundation in Surabaya, Indonesia. The rationale for taking the schools into account was the fostered kindergarten under Indonesian Pediatrician Association in East Java Province. The cluster random sampling technique was adapted to select the participants of the study. The present study also applied inclusion and exclusion criteria in determining the participants. The inclusion criteria included children aged five to six-a-half years old, enrolled in class B (the second year of the study times), and supported by the parents by acknowledging the consent forms. The exclusion criteria encompassed children with particular development issues, intellectual disabilities, and absences during the data collection. After the tough selection, there were 56 students from four schools participated in the study. Data were collected using PDQ, MCH handbook, and NST forms. The obtained data were displayed in the form of frequency tables and cross-tabulations. NST was considered the gold standard in determining the children's readiness to enter elementary school so that a validity test would be carried out using

the calculation of sensitivity, specificity, positive predictive value, and negative predictive value using the Chi-squared test with the assistance of IBM SPSS 25. The data were displayed in a descriptive form. The ethical feasibility of the present study was issued by the Ethics Committee of Dr. Soetomo Hospital on 31 January 2022 in Surabaya with the number 0365/KEPK/I/2022.

### PDQ, MCH Handbook, and NST

Pre-screening developmental questionnaire (PDQ) is a questionnaire for preliminary screening of children aged 3 months to 6 years conducted by parents. There are 10 questions about children's development that parents must fill out with *yes* and *no* answers. If the *yes* answer is less than 9, it is suspected that there is a problem with the child's development.<sup>21,22</sup> The PDQ model was first translated and modified by the Indonesian Ministry of Health team in 1996 and was revised in 2005. In Indonesia, PDQ is well-known as *Kuesioner Pra Skrining Perkembangan* (KPSP). This questionnaire is recommended by the Ministry of Health of the Republic of Indonesia to be used at the primary healthcare level as an effort to detect early childhood growth and development. It encompasses several aspects: language and communication, physical and motor, and social-emotional states.<sup>23</sup> Besides, Indonesian parents also have a mother and child (MCH) handbook to monitor their children's development. They usually get the book from nearby healthcare services or midwives after giving birth. *Child Care and Child Development Monitoring* is one of the chapters in the MCH handbook. In that section, there is a checklist for statements that can be circled *yes* or *no* according to the child's development based on age. If the child has not been able to do one of the checklists, then the child needs to be taken to a nearby healthcare facility. The child development checklist in the MCH handbook includes 69 items measuring children's gross motor, language, fine motor, and social independence skills to examine the children's readiness to enter elementary school.<sup>24</sup>

Compared to PDQ and MCH handbook, the *Nijmeegse*

*Schoolbekwaamheid Test* (NST) is one of the tests commonly used to measure children's school readiness that has been known in Indonesia since 2010. It has been used in various studies in Indonesia examining the maturity of kindergarten students. It is a non-verbal test tool and is presented individually so that children's maturity in terms of cognitive, motor, and social emotions can be generated.<sup>25</sup> Its list of questions measures *sociale san passing* or social ability that aims to see the level of children's behaviour in a group, *taakbesef of weekbekwaamheid* or learning to behave that aims to look at the children's readiness, sincerity, and perseverance in carrying out their duties, and *zelfstandigheid* or independence that aims to unravel the child's ability to perform a task without helps and encouragements.<sup>26</sup>

## RESULTS

The present study was undertaken with 56 children from four kindergarten schools under the guidance of the Indonesian Pediatric Association of East Java Province. All participants declared their participation in the study by completing the consent form. Figure 1 shows how the participants were chosen.

Prior to the validity results of the PDQ and MCH handbook as the measure in determining children's school readiness, the present study first depicted the

demographic data of the participants. This was necessary to discuss the main findings with the participants' background information to make conclusions. Table 1 portrays the participants' demographic data.

Table 1 portrays that the numbers of female students are insignificantly greater than those of male students. This implied that the findings of the study could be a relatively fair judgment. Most of the participants were six to six-a-half years old. Most of their fathers graduated from senior high school and so were their mothers with the mode value of family income of IDR 1,700,000 to IDR 4,300,000. Most of the participants were taken care of by their parents and only 1 student was taken care of by his grandparents. The overall data explained that the participants' families had slightly below the average economic standard, of which Surabaya's minimum salary in 2022 was IDR 4,375,000.

Before portraying the validity test results, the present study tried to unravel the suitability of the child's development with the suggested development stages based on PDQ, MCH handbook, and NST. This contrast was essential due to the examination of the measurement contents of the PDQ, MCH handbook, and NST. Table 2 defines the results of the suitability of the child's development with the suggested development stages for each variable.

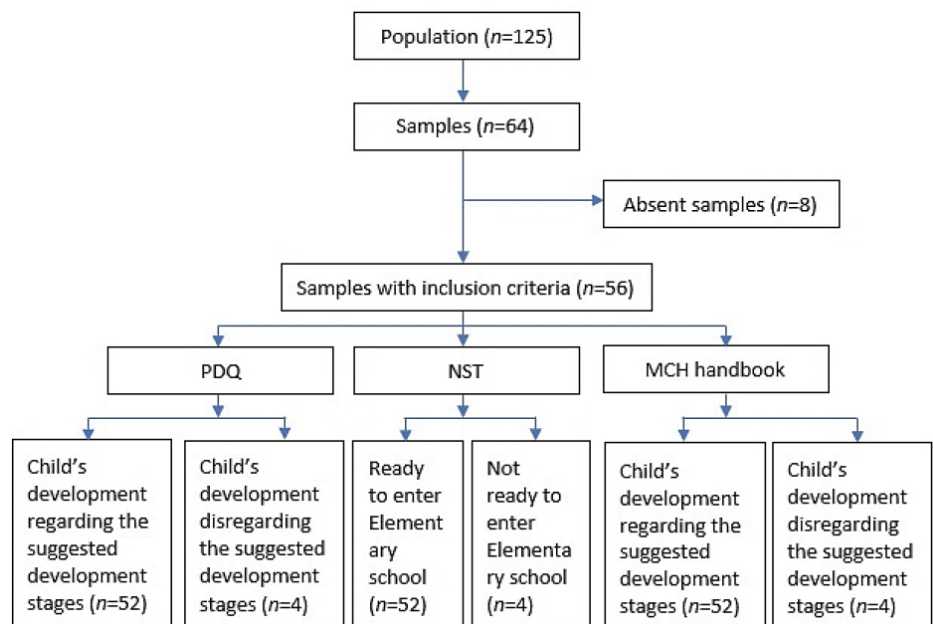


Figure 1. Participants' selection process.

**Table 1. Participants' demographic data.**

Aspects	Ready to enter elementary school based on NST <i>n</i> (%)	Not ready to enter elementary school based on NST <i>n</i> (%)	<i>P</i> *
Gender			
- Male	24 (42.8)	2 (3.6)	1.000
- Female	28 (50)	2 (3.6)	
Age			
- 60-65 months	1 (1.8)	0 (0)	0.614
- 66-71 months	5 (8.9)	1 (1.8)	
- 72-78 months	46 (82.1)	3 (5.4)	
Child order			
- First	19 (33.9)	1 (1.8)	0.435
- Middle	10 (17.9)	0 (0)	
- Last	23 (41)	3 (5.4)	
Number of siblings			
- 1-3	47 (83.9)	4 (7.1)	1.000
- 4-6	5 (8.9)	0 (0)	
Father's education			
- Elementary School	8 (14.3)	0 (0)	0.673
- Junior High School	11 (19.6)	2 (3.6)	
- Senior High School	28 (50)	2 (3.6)	
- Bachelor	5 (8.9)	0 (0)	
Mother's education			
- Elementary School	12 (21.4)	0 (0)	0.261
- Junior High School	8 (14.3)	2 (3.6)	
- Senior High School	24 (42.8)	1 (1.8)	
- Bachelor	8 (14.3)	1 (1.8)	
Family income			
- < IDR 1,700,000	18 (32.1)	2 (3.6)	0.884
- IDR 1,700,00 – IDR 4,300,000	30 (53.6)	2 (3.6)	
- > IDR 4,300,000	4 (7.1)	0 (0)	
Parenting system			
- Parents	48 (83.8)	3 (5.4)	0.053
- Grandparents	1 (1.8)	1 (1.8)	
- Both	3 (5.4)	0 (0)	

**Table 2. The suitability of children's development with their suggested developmental stages based on PDQ and MCH handbook.**

Variable	Child development regarding the development stages <i>n</i> (%)	Child development disregarding the development stages <i>n</i> (%)	Total of Cases <i>n</i> (%)
PDQ	52 (92.9)	4 (7.1)	56 (100)
MCH handbook	43 (76.8)	13 (23.2)	56 (100)

**Table 3. Children's school readiness based on NST.**

Variable	Ready to enter elementary school <i>n</i> (%)	Not ready to enter elementary school <i>n</i> (%)	Total of Cases <i>n</i> (%)
NST	52 (92.9)	4 (7.1)	56 (100)

Table 2 describes that, for every 100 children, 93 children showed appropriate development according to the suggested development stages. Meanwhile, the MCH handbook shared that, for every 100 children, 77 children had perceived the suggested child development stages.

This showed that the majority of the participants had appropriate child development. Moreover, Table 3 depicts the children's school readiness based on NST. In this study, for every 100 children, 93 children were considered ready to enter elementary school. In coping with the

results of the PDQ and MCH handbook's validity, Table 3 explains the sensitivity, specificity, positive predictive value, and negative predictive value.

Table 4 showed that there was a significant relationship between PDQ and NST. Moreover, Table 5 depicted

**Table 4. Results of children's readiness to enter elementary school based on PDQ and NST.**

Variable	NST		Total	p	
	Ready to enter elementary school n (%)	Not ready to enter elementary school n (%)			
PDQ	Child development regarding the development stages	50 (96.1)	2 (3.8)	52 (100)	0.022*
	Child development disregarding the development stages	2 (50)	2 (50)	4 (100)	
	Total	52 (92.9)	4 (7.1)	56 (100)	

Sensitivity: 96.2%; Specificity: 50%; Positive predictive value: 96.2%; Negative predictive value: 50%

\* Significance at  $p < .05$

**Table 5. Results of children's readiness to enter elementary school based on the MCH handbook and NST.**

Variable	NST		Total	p	
	Ready to enter elementary school n (%)	Not ready to enter elementary school n (%)			
MCH Handbook	Child development regarding the development stages	42 (97.7)	1 (2.3)	43 (100)	0.035*
	Child development disregarding the development stages	10 (76.9)	3 (23.1)	13 (100)	
	Total	52 (92.9)	4 (7.1)	56 (100)	

Sensitivity: 80%; Specificity: 75%; Positive predictive value: 97.7%; Negative predictive value: 23.1%

\* Significance at  $p < .05$

that there was a significant relationship between the MCH handbook and NST. By referring to both tables, PDQ and MCH handbook shared similar measurements in determining children's development and their school readiness. Regarding Table 4, the PDQ sensitivity value of 96.2% indicated that PDQ showed an ability to obtain child development in accordance with the suggested stages of those who were ready to enter elementary school. PDQ's specificity value of 50% indicated the PDQ's ability in portraying those who were not ready to enter elementary school. The PDQ's positive predictive value of 96.2% indicated a true probability of being ready to enter elementary school if the results of the PDQ were in accordance with the suggested stages. Meanwhile, the PDQ's negative predictive value of 50% indicated that it was true that it is not ready to enter elementary school if the results of the PDQ were not according to the suggested development stages.

In accordance with the validity results portrayed in Table 5, the sensitivity value of the MCH handbook of 80% indicated that the MCH handbook conveyed the ability

to obtain child development outcomes according to the suggested development stages of those who were ready to enter elementary school. The specificity value of the MCH handbook of 75% indicated that the MCH handbook had the ability to obtain child development outcomes that were not in accordance with the suggested stages of those who were not ready to enter elementary school. The positive predictive value of the MCH handbook of 97.7% indicated a true probability of being ready to enter elementary school if the results of the MCH handbook were in accordance with the suggested development stages. Whereas, the negative predictive value of the MCH handbook of 23.1% indicated a true probability of not being ready to enter primary school if the results of the MCH handbook were not in accordance with the suggested development stages.

## DISCUSSION

The present study did not share significant differences between male and female students in their readiness to enter elementary school. The previous study stated that there was no significant

difference between gender and the children's readiness to enter elementary school ( $p = 0.095$ ).<sup>27</sup> The participants were around six to six-a-half years old with 82.1% of them ready to enter elementary school. Based on the regulation of the Minister of National Education of the Republic of Indonesia Number 19 of 2007 concerning the policy of admitting new elementary school students aged at least 6 years and under the age of 6 years, it should be enclosed with written recommendations from competent stakeholders such as school counsellors or psychologists.<sup>27</sup> Almost half of the participants who were ready to enter elementary school were the first child of a family with 1-3 siblings. The majority of the participants' parents' family income was around IDR 1,700,000 to IDR 4,300,000. This implied that most families came from slightly below-average economic income due to the fact that the standard minimum salary in Surabaya was IDR 4,375,000 for each worker. This phenomenon was probably caused by their parent's educational background, which only pursued senior high school degrees. At last, 83.8% of the participants were

taken care of and lived by their parents.

In connection with children's readiness to enter elementary school, PDQ showed that 92.9% of the participants were ready to enter the school. Similarly, Yulianti (2018) found that, of 95 research subjects in children aged 2-6 years old regarding the analysis of monitoring the growth and development of kindergarten students using PDQ, it was found that 89.5% of children's development was in accordance with the suggested development stages. In another study conducted by Barbara & Syaidah (2022) for children aged 5-6 years old who were screened by using PDQ, only 32% of the 28 children had appropriate child development according to the suggested development stages.<sup>28</sup> This implied that PDQ had the ability to measure children's school readiness. Meanwhile, the MCH handbook showed that 97.7% of the participants had appropriate child development regarding the suggested child development stages. In this study, the suitability of the child's developmental stage based on the MCH handbook and PDQ obtained  $p = .035$  ( $p < .05$ ), which meant that there was a significant relationship between the suitability of the developmental stage based on the MCH handbook and PDQ. There had been no study on the relationship between the suitability of children's developmental stages based on the MCH Handbook and PDQ.

A screening tool must meet the validity, reliability, sensitivity, specificity, acceptability, and suitability. Validity and reliability were the parameters to determine the quality of the instrument, while sensitivity and specificity were measured by comparing developmental tests to the gold standard that was NST.<sup>23</sup> A good developmental test must have a sensitivity and specificity of  $> 70-80\%$  so as not to cause overdetection or underdetection. In this study, the sensitivity of the PDQ and MCH handbook were 96.2% and 80%, respectively. As the screening tool, PDQ was a questionnaire for preliminary screening of the development of children aged three months to six years with four aspects of the measurement namely gross motor, fine motor, speech/language, and socialization/independence.<sup>22</sup> The PDQ format used in this present study was PDQ

60 months, 66 months, and 72 months. The present study revealed that the PDQ had able to do pre-screening for children's readiness to enter elementary school. The PDQ sensitivity value of 96.2% indicated that, for every 100 children, 96 children showed appropriate child development based on PDQ and the others did not have appropriate child development. This ability was considered highly valid in evaluating the child's development. Moreover, the positive predictive value was also higher so that it could show a true probability in determining those who were ready for elementary school. To the best of the researcher's knowledge, there have been no studies examining the sensitivity and specificity of PDQ toward the NST. Additionally, there had been no studies validating PDQ as a measure for determining children's readiness to enter elementary school.

Regarding the MCH handbook, *Child Care and Child Development Monitoring* became the principal chapter in the handbook as there was a checklist for statements that measured a child's development based on age. The previous study stated that growth and development problems could be minimized by parents as described in the MCH Handbook.<sup>29</sup> The MCH handbook used correctly would have an impact on increasing parents' knowledge about efforts to maintain the child's health, mobilize and empower people to live healthy lives, increase public access to quality health services and improve surveillance, monitoring, and health information systems.<sup>29</sup> In coping with the measurement of children's school readiness, the present study found that the MCH handbook had shared good validity test results with a sensitivity of 80%, specificity of 75%, a positive predictive value of 97.7%, and a negative predictive value of 23.1%. These results implied that the MCH handbook had a valid measurement besides NST in determining children's readiness to enter elementary school. There had been no studies on sensitivity, specificity, positive predictive value, and negative predictive value of the MCH handbook in children's readiness to enter elementary school.

The NST and MCH handbook actually did not have the same function as test tools

for children's readiness to enter elementary school. Both conveyed differences in terms of time and practicality in their utilization, however, some similarities might be identified such as assessing the physical, motor, and social-emotional aspects. In terms of time, using the MCH handbook was easier and faster than the NST as it also measured the same variables. The previous study stated that NST had good validity and reliability when applied to participants from East Java, Indonesia, but there was no research on the MCH handbook for children's readiness to enter elementary school.<sup>19</sup> NST was chosen as a criterion to determine the validity of the MCH handbook due to evidence that it had good validity and high reliability as a test tool to determine children's school readiness.<sup>14</sup>

The present study implied that parents could monitor their children's school readiness based on the PDQ and MCH handbooks. They could independently determine the decision where is the appropriate time to send their children to elementary school. Moreover, teachers could provide better teaching techniques and counseling for those who were not ready to enter elementary school. For practitioners working in the field of child development and education, the PDQ and the MCH handbook could be used to measure school readiness in addition to using NST. In terms of administration, PDQ and MCH handbooks were more practical and had good validity based on the results of the present study.

The present study recommends the use of PDQ and MCH handbook as both have conveyed similar results of the NST's child development measurement. Moreover, both PDQ and MCH handbook's sensitivity, specificity, positive predictive value, and negative predictive value have good validity. This finding can be used by many Indonesian parents regardless of their NST accessibilities. In coping with future research, the present study recommends further investigations on how the PDQ and MCH handbook can be used to predict learning readiness.

## CONCLUSION

Indonesian parents should not be worried about when should send their children to

elementary school. They can use PDQ and MCH handbooks as the reference for them deciding their children's school readiness.

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## CONFLICT OF INTEREST

The author reports no conflicts of interest in this work. The authors declare that (s) he has no relevant or material financial interests that relate to the research described in this paper. The authors declare no conflict of interest.

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## AUTHOR CONTRIBUTION

All authors similarly contribute to the think about from the investigate concepts, information acquisitions, information investigation, factual investigations, changing the paper, until detailing the consider comes about through publication.

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