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Development of Health Belief Model (HBM) Behavioral Instrument in the Framework of Preventing DM in School Age Children

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ABSTRACT

Introduction: Prevention of DM in school-age children is very important because the main risk factors for type 2 DM, such as poor diet and lack of physical activity, often begin at an early age. The Health Belief Model (HBM) is one of the health psychology approaches that can be used to understand and motivate individuals to take preventive measures against diseases, including diabetes.
Objective: The aim of this research is to develop a research instrument on the prevention of diabetes mellitus in school -age children .
Method: The type of research used is *Research and Development* . The sample of the development of this research instrument was conducted on 30 respondents, namely children with Diabetes Mellitus aged 10-19 years who attend junior high schools in the working area of the Grubug Health Center, Grobogan, Central Java . Analysis of the development of research instruments on the prevention of DM in school-age children using the validity and reliability test of the instrument.
Results: The results of the instrument development based on the validity test of 17 question items show that for statements 1 to 17, the lowest $_{\text{calculated r}}$ is 0.421 and the highest $_{\text{calculated r}}$ is 0.799 , so that the 17 statements of the DM prevention questionnaire in school children are valid . Meanwhile, the results of the reliability test on the 17 items of this research questionnaire have a total *Cronbach's Alpha* value per variable $\geq$ 0.60, so that the research questionnaire is reliable (consistent).
Conclusion: The research instrument in the form of a questionnaire on the prevention of DM in school children consisting of 17 questions was declared valid and reliable, so it can be used as a research instrument. The instrument developed has important implications in research and interventions for diabetes prevention in children.

Keywords : children, DM prevention, HBM, , reliability, validity

INTRODUCTION

Type 2 diabetes mellitus (DM) in school -age children has become an increasingly pressing health problem along with the increasing prevalence of obesity and unhealthy lifestyles. The increasing rate of obesity in children, which is associated with high sugar consumption and low physical activity, has increased the incidence of type 2 diabetes in various parts of the world, including in Indonesia (Kurniawan, 2020). Data from the International Diabetes Federation (IDF) reveals that the prevalence of diabetes in children under 20 years of age continues to increase, and Indonesia is listed as one of the countries with the highest prevalence of diabetes (IDF, 2022).

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The Health Belief Model (HBM) is a health psychology approach that can be used to understand and motivate individuals to take preventive measures against diseases, including diabetes. The HBM identifies cognitive factors that influence an individual's decision to act or not to act on a particular health risk. This model includes important dimensions such as perceived susceptibility to disease, perceived severity of disease, perceived benefits of prevention, perceived barriers faced, and cues to action (Julianti et al., 2023). In the context of preventing DM in children, the HBM can be used to identify how children and their parents perceive the risk of DM and how willing they are to make behavioral changes.

Prevention of DM in school -age children is very important because the main risk factors for type 2 DM, such as poor diet and lack of physical activity, often begin at an early age. Modifying children's behavior to adopt a healthy lifestyle can reduce the prevalence of type 2 DM that occurs in children in the future. Research shows that changing eating habits and increasing physical activity have a significant impact on preventing the development of diabetes in children (Nina et al., 2024). Therefore, it is important to develop an HBM-based instrument that can be used to evaluate and promote preventive behavior changes in school -age children .

A well-designed HBM-based instrument can help measure children's perceptions of diabetes risk factors, which can then be used to design more effective interventions. Previous studies have found that perceptions of their susceptibility to diabetes, disease severity, and the benefits of healthy behaviors greatly influence preventive behaviors taken by individuals (Alifah et al., 2024). The development of this instrument should also involve an age- appropriate approach for children, so that they can understand and respond to health information effectively.

In addition, the role of the family is very important in supporting diabetes prevention behavior in children. Research shows that parental involvement in managing children's health can strengthen the success of diabetes prevention interventions (Kurniawan, 2020). Therefore, this HBM instrument must include dimensions that involve the family, as well as provide an overview of how parents and children can work together to change their behavior towards a healthier lifestyle.

This study aims to develop and test an HBM-based instrument that can be used to assess DM prevention behavior in school -age children . With this instrument, it is expected to obtain more comprehensive data to design more effective diabetes prevention programs, both at the individual, family, and community levels.

MATERIALS AND METHODS

The type of research used is *Research and Development* . The research and development method or *Research and Development* is a research method used to produce certain products, and test the effectiveness of the product . (Sugiono, 2015); (Haikal, 2019).

In general, the steps used to develop the instrument are 1. the test design stage consisting of: determining the purpose of the test, determining the material to be tested, compiling the test grid, writing items, validating items, improving items and assembling the test, and compiling scoring guidelines; 2. test trials consisting of: determining the test subjects, implementing the trial, and analyzing the test results data. (Krisdiyanto, et al. 2022)

The sample of this research instrument development was conducted on 30 respondents, namely children with Diabetes Mellitus aged 10-19 years who attend junior high schools in the working area of the Grubug Health Center, Grobogan, Central Java . Analysis of the development of research

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instruments on HBM behavior in preventing DM in school-age children using the validity and reliability tests of the instrument. The validity test uses the *Pearson Product Moment correlation* (r) by looking at the output results of *the Corrected Item Total Correlation* , while the Reliability Test is measured by the *Cronbach Alpha statistical test.* .(Sugiono, 2015)

RESULTS

Behavioral Instrument for Prevention of Diabetes Mellitus (DM) in School -Age Children .

Table 1. Behavioral Instruments for Preventing Diabetes Mellitus (DM) in School -Age Children .

No	HBM Behavior in the Framework of DM Prevention In School Age Children	Answer				
		1	2	3	4	5
Part I: Perceived Susceptibility						
1	How likely is it that your child will develop type 2 diabetes mellitus in the future?					
2	Can type 2 diabetes mellitus affect children around you?					
3	I feel that my child is at risk of developing type 2 diabetes mellitus if he does not maintain a healthy diet.					
Part II: Perceived Severity						
4	The impact of type 2 diabetes mellitus is particularly severe for children.					
5	Type 2 diabetes mellitus can cause long-term health problems (e.g. heart, kidney, vision damage).					
6	Type 2 diabetes mellitus can reduce my child's quality of life in the future.					
Part III: Perceived Benefits						
7	Changing my child's diet can reduce the risk of diabetes mellitus in children.					
8	Physical activity (sports) is very effective in preventing type 2 diabetes mellitus in children.					
9	I am confident that by following a healthy diet and exercising, my child can avoid diabetes.					
Part IV: Perceived Barriers						
10	I find it difficult to change my child's diet because he prefers unhealthy foods.					
11	Organizing my child's physical activity is very difficult due to lack of time or facilities.					
12	There are additional costs involved in maintaining a healthy diet for my child.					
Part V: Self-Efficacy						
13	I feel capable of helping my child adopt a healthy lifestyle (healthy diet and regular exercise).					

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14	I feel confident in educating children about the importance of maintaining a healthy diet.					
Part VI: Cues to Action						
15	Someone (e.g. doctor, teacher, parent, friend) gave my child advice to live healthier.					
16	Messages from the media or health campaigns motivate my child to adopt a healthy lifestyle.					
17	My child and I often get information about preventing diabetes mellitus from school or the surrounding environment.					

Note:
1 = Strongly Disagree
2 = Disagree
3 = Neutral
4 = Agree
5 = Strongly Agree

Validity Test

Table 1. Validity Test Results

No	Questionnaire Items	Corrected Item Value-Total Correlation (*Pearson Product Moment Test*))	Note
1	Questionnaire 1	0.633	Valid
2	Questionnaire 2	0.421	Valid
3	Questionnaire 3	0.459	Valid
4	Questionnaire 4	0.432	Valid
5	Questionnaire 5	0.579	Valid
6	Questionnaire 6	0.635	Valid
7	Questionnaire 7	0.675	Valid
8	Questionnaire 8	0.526	Valid
9	Questionnaire 9	0.482	Valid
10	Questionnaire 10	0.450	Valid
11	Questionnaire 11	0.769	Valid
12	Questionnaire 12	0.489	Valid
13	Questionnaire 13	0.582	Valid
14	Questionnaire 14	0.712	Valid
15	Questionnaire 15	0.506	Valid
16	Questionnaire 16	0.799	Valid
17	Questionnaire 17	0.689	Valid

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Research using the questionnaire method requires a validity test. Validity testing is useful for determining the validity or suitability of the questionnaire used by researchers to obtain data from respondents or research samples (Ghozali, 2011). Validity testing with *Pearson Product Moment Correlation* uses the principle of connecting each item or question score with the total score obtained from respondents' answers to the questionnaire. The basis for decision making in the validity test is done by *comparing* the $_{\text{calculated}}$ r value with the $_{\text{table r value}}$ with the following criteria:

a) if the $_{\text{calculated}}$ r value > r $_{\text{table}}$, then the questionnaire item is declared valid;

b) if the $_{\text{calculated}}$ r value < r $_{\text{table}}$, then the questionnaire item is declared invalid.

validity and reliability test of the questionnaire was conducted on 30 people . This was done in order to obtain a distribution of measurement results close to normal . (Notoatmojdo, 2018) . The validity test of the research questionnaire was conducted on 30 respondents, namely children with Diabetes Mellitus aged 10-19 years who attended junior high schools in the Grubug Health Center, Grobogan, Central Java . Based on table 1, it is known that the results of the validity test of 17 question items based on calculations with the *SPSS for Windows program* (N = 30; α = 5%; df = n-2; r $_{\text{table}}$ = 0.361) it is known that for statements 1 to 17, the lowest $_{\text{calculated r}}$ is 0.421 and the highest $_{\text{calculated r}}$ is 0.799. Thus, the 17 statements of the DM prevention questionnaire in school children are valid.

Reliability Test

Reliability testing can be done simultaneously for all the questions or items in the research questionnaire. (Ghozali, 2011). The basis for decision making in reliability testing is as follows:

a) if *the Cronbach's Alpha* value > 0.6 then the questionnaire is declared reliable or consistent;

b) if *the Cronbach's Alpha* value < 0.6 then the questionnaire is declared unreliable or inconsistent.

The results of calculations using *the SPSS for Windows program* (N= 30; α= 5%) the following reliability test results were obtained:

Table 2. Reliability Test Results

No	Questionnaire Items	*Cronbach's Alpha* Value	Note
1	Questionnaire 1	0.765	Reliable
2	Questionnaire 2	0.790	Reliable
3	Questionnaire 3	0.795	Reliable
4	Questionnaire 4	0.799	Reliable
5	Questionnaire 5	0.775	Reliable
6	Questionnaire 6	0.750	Reliable
7	Questionnaire 7	0.791	Reliable
8	Questionnaire 8	0.738	Reliable
9	Questionnaire 9	0.791	Reliable
10	Questionnaire 10	0.763	Reliable
11	Questionnaire 11	0.745	Reliable
12	Questionnaire 12	0.764	Reliable
13	Questionnaire 13	0.769	Reliable

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No	Questionnaire Items	*Cronbach's Alpha* Value	Note
14	Questionnaire 14	0.748	Reliable
15	Questionnaire 15	0.759	Reliable
16	Questionnaire 16	0.785	Reliable
17	Questionnaire 17	0.759	Reliable

Table 2 shows that each questionnaire in the 17 items of this research questionnaire has a total *Cronbach's Alpha* value per variable $\geq$ 0.60, so that the research questionnaire is reliable (consistent) and can be used in research. The dimensions of the diabetes mellitus prevention instrument at school age include: *Perceived Susceptibility* , Perceived *Severity* , *Perceived* Benefits, *Perceived Barriers*, Self-confidence, and, cues to action

The importance of instruments on preventing diabetes mellitus at school age is also supported by previous research which states that with the prevalence of diabetes mellitus cases continuing to increase, it is necessary to improve efforts to prevent diabetes mellitus, especially in children and adolescents . (Devi, et al. 2023)

Preventing diabetes mellitus during school age is crucial. During school age, children experience a crucial transition period in terms of both physical and behavioral development. A 2023 peer-led study in Tehran showed that a peer-led educational intervention significantly improved knowledge, health beliefs, and preventative behaviors for type 2 diabetes in adolescent girls (Dorosteh et al., 2023). This suggests that educational programs implemented directly in the school setting—particularly those involving peers—can be effective in changing dietary patterns, increasing physical activity, and promoting healthy lifestyle habits before the onset of symptoms or prediabetes. Furthermore, a recent systematic analysis (Neelapaichit, Phonyiam, & Witwaranukool, 2025) confirmed that school-based programs are an ideal platform for delivering these interventions, although evidence for evaluating their long-term effectiveness is still being developed.

CONCLUSIONS

Based on the results of this study, the development of a questionnaire instrument for the prevention of Diabetes Mellitus (DM) in school -age children using the Health Belief Model (HBM) approach has been successfully carried out. The instrument consisting of 17 question items was tested for validity and reliability. The results of the validity test showed that all question items had a *calculated r value* greater than *r table* , with the highest *calculated r value* reaching 0.799 and the lowest 0.421, indicating that the questionnaire was valid. Meanwhile, the reliability test using Cronbach's Alpha showed that the reliability value for all question items was greater than 0.6 , indicating that the instrument was reliable and consistent for use in further research.

The developed instrument has important implications in research and intervention of diabetes prevention in children. With proven validity and reliability, this instrument can be used to measure children's and their parents' perceptions of diabetes risk factors, as well as to assess preventive attitudes and behaviors towards DM. This can help researchers, educators, and health workers in designing more

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appropriate and effective education and intervention programs. The use of this instrument also has the potential to increase awareness and behavioral changes in children and families in implementing a healthy lifestyle to prevent type 2 diabetes mellitus in the future.

This instrument can be expanded to be applied in other regions with different demographic characteristics, providing further insight into diabetes prevention efforts in school -aged children more broadly.

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