



# Validation and Reliability of Lifestyle Instruments for Indonesian Adolescents with Hypertension Family History: A Rasch Model

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## Abstract

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**BACKGROUND:** There are lifestyle changes among adolescents in this modern era, such as less physical activities, because many activities can be carried out using modern technology, unhealthy food habits such as eating junk food, canned food and beverages, and preserved fruits and vegetables, poor sleeping habits, stress, and smoking behavior. These lifestyles are harmful and lead to cardiometabolic diseases such as obesity and hypertension, especially in adolescents with hypertension history in the family.

**AIM:** This study aimed to assess the validation and reliability of healthy lifestyle instruments for Indonesian adolescents with a family history of hypertension.

**METHODS:** This study is a survey research conducted from July 2021 to February 2022 in South Sumatera, Indonesia. The subjects were adolescents with a family history of hypertension and recruited using purposive random sampling. Adolescents aged 10–18 years old who returned signed parental consent forms, gave written assent to participate, and completed the questionnaire were included in the study. The questionnaire was consisted of three sections, Section I contained internal factors, Section II related to external factors, and Section III related to healthy lifestyle. The study was approved by the Research Ethics Committee Universitas Padjadjaran Bandung. Winsteps software was used to analyze the validity, reliability, unidimensionality, and rating scale.

**RESULTS:** Obtained 103 valid question items with OUTFIT values  $0.5 < \text{mean square} < 1.5$ ;  $-2.0 < \text{ZSTD} < 2.0$ ; and the point measure correlation (Pt Mean Corr) value is in the range of  $0.32 < \text{Pt Measure Corr} < 0.85$ . The reliability value of respondents and instruments is 0.88, with a Cronbach's alpha value of 0.95. The raw variance explained by the measured value is 72.3%, and all unexplained variance values are  $<15\%$ .

**CONCLUSIONS:** Healthy lifestyle instruments are valid and reliable, so it is feasible to measure the healthy lifestyle of Indonesian adolescents with a family history of hypertension. This instrument can measure the success of a program or intervention in changing a lifestyle in adolescents at risk of developing hypertension, especially adolescents with a family history of hypertension. We suggest further research involving more participants in a broader area. We hope the healthy lifestyle instruments can be used in a standardized manner for all regions of Indonesia.

## Introduction

Lifestyle has been recognized as an essential determinant of health status in recent decades and has become a focus of increasing research interest worldwide [1]. There are lifestyle changes among adolescents in this modern era, such as less physical activities because many activities can be carried out using modern technology, unhealthy food habits such as eating junk food, canned food and beverages, and preserved fruits and vegetables, poor sleeping habit, stress, and smoking behavior [2], [3]. These lifestyles are harmful and lead to cardiometabolic diseases such as obesity and hypertension [4].

Hypertension and elevated blood pressure prevalence among Indonesian adolescents in Palembang, South Sumatera, are currently high, 8% and 12.2%, respectively [5]. Particularly, adolescents with a family

history of hypertension had a higher risk than those without a family history of hypertension [5], [6]. Adolescents usually imitate the unhealthy lifestyles of their parents, teachers, friends, and public figures [7], [8]. Although it is difficult to change unhealthy lifestyles, many effects of health risk factors are avoidable if these behaviors are identified and changed at an early stage [8], [9]. Therefore, concerned about healthy lifestyle among adolescents with a family history of hypertension should be given. This study aimed to assess the validation and reliability of healthy lifestyle instruments for Indonesian adolescents with a family history of hypertension.

## Methods

This study is a survey research conducted from July 2021 to February 2022 in South Sumatera,

Indonesia. The subjects were adolescents with a family history of hypertension and recruited using purposive random sampling. The study was approved by the Research Ethics Committee Universitas Padjadjaran Bandung. Researchers introduce themselves and explain the purpose of the study before the questionnaires were distributed. Each participant was asked to read the instructions before answering the questionnaire and answered individually. A written informed consent and verbal ascent of each study participant was obtained before recruitment. Adolescents aged 10–18-years-old who returned signed parental consent forms, gave written assent to participate, and completed the questionnaire were included in the study. In filling out the instrument, the researcher accompanies the respondent so that the respondent can understand the questions in the questionnaire to avoid the possibility that the respondent does not understand the question item.

There were three sections in the questionnaire. Section I contained 35 items related to the internal factors that affect healthy lifestyles in Indonesian adolescents with a family history of hypertension, such as comprehension, awareness, intention, religion and belief, and self-control. Section II relates dimensional constructs external factors that involve physical and social environment, such as peer groups, family conditions, school situations, local circumstances, and health services, which contains 37 items. For Section III, 48 items were related to healthy lifestyles (physical activity, food and sleep habit, stress, and smoking behavior). Likert scale of five options used for adolescents stated degree of agreement with each item submitted. In Sections I and II, adolescents were asked to state either strongly disagree (1), disagree (2), neither agree nor disagree (3), agree (4), and strongly agree (5). Adolescents were asked to state either never (1), rarely (2), sometimes (3), often (4), and always (5) in Section III. The operational definitions of the instrument are listed in Table 1. Winsteps software was used to analyze the validity, reliability, unidimensionality, and rating scale (10).

The Rasch model also has several advantages, because it fulfills the five principles of the measurement model, namely, (1) being able to provide equal intervals on a linear scale; (2) have the ability to predict the missing data; (3) can provide a more precise estimate because it does not only depend on the number of correct answers; (4) identification of error responses and guesses so as to detect model inaccuracies; and (5) produce replicable measurements [10], [11]. Therefore, analysis using the Rasch model can evaluate the strengths and weaknesses of the instrument properly [12].

## Results and Discussion

The study included 82 adolescents with a family history of hypertension. The participant characteristics

**Table 1: Operational definition of healthy lifestyle formation instrument**

Number	Variable	Operational definition	Measuring scale
1.	Comprehension	Adolescent's understanding of healthy lifestyle	Likert rating
2.	Awareness	Self-influence leading to healthy lifestyle	Likert rating
3.	Self-intention	Self-desire to live healthy	Likert rating
4.	Religion and belief	The influence that comes from religion and beliefs that are believed in adolescents regarding a healthy lifestyle	Likert rating
5.	Self-control	Self-ability to maintain healthy lifestyle	Likert rating
6.	Peer group	Factors outside of adolescents come from peers and the environment that affect the formation of a healthy lifestyle	Likert rating
7.	Family condition	Factors from parents and family which contribute to lifestyle	Likert rating
8.	School situation	Factors from teachers and education which contribute to the formation of a healthy lifestyle	Likert rating
9.	Community condition	Factors from community and neighborhood which contribute to lifestyle	Likert rating
10.	Youth health service	Factors from health service and facilities which contribute to healthy lifestyle	Likert rating
11.	Exercise	Factors that reflect a healthy lifestyle by assessing daily physical activities	Likert rating
12.	Dietary habit	Factors that reflect a healthy lifestyle by assessing daily food	Likert rating
13.	Sleeping habit	Factors that reflect a healthy lifestyle by assessing daily sleeping habit	Likert rating
14.	Emotional stress	Factors that reflect a healthy lifestyle by assessing emotional stress	Likert rating
15.	Smoking behavior	Factors that reflect a healthy lifestyle by assessing daily smoking habit	Likert rating

are presented in Table 2. There were 39 (47.6%) males and 43 (52.4%) females. Most of the participants were in the late-adolescence (40.2%), senior high school students (41.5%), lived in urban areas (64.6%) and had family history of hypertension from their mother (50%).

**Table 2: Participant characteristics**

Characteristics	n (%)
Age (years old)	
10–13	23 (28)
14–16	26 (31.7)
17–18	33 (40.2)
Gender	
Male	39 (47.6)
Female	43 (52.4)
Education level	
Elementary school	21 (25.6)
Junior high school	27 (32.9)
Senior high school	34 (41.5)
Domicile	
Urban	53 (64.6)
Rural	29 (35.4)
Family history of hypertension	
Father	37 (45.1)
Mother	41 (50)
Both	4 (4.9)

In the validity test, there were 103 valid question items with OUTFIT values  $0.5 < \text{mean square (MNSQ)} < 1.5$  and  $-2.0 < \text{standardized fit statistics (ZSTD)} < 2.0$ ; and the point measure correlation (Pt. measure corr.) value is in the range of  $0.32 < \text{Pt. Measure Corr.} < 0.85$ . The results of the instrument validity test are shown in Table 3.

In the reliability test, the respondent's reliability value is 0.88 with a respondent separation value of 2.69, which is rounded up to 3. The instrument reliability value is 0.88 with an instrument separation value of 2.65, which is rounded up to 3. Cronbach's alpha value

Table 3: Instrument validity analysis

Item code	Statement	Fit statistic			Interpretation
		MNSQ	ZSTD	Pt. Measure Corr.	
<b>Comprehension</b>					
A1	I understand how to practice healthy lifestyle	1.46	0.9	0.35	Valid
A2	I understand that healthy lifestyle should be practiced as soon as possible	0.99	0.0	0.05	Valid
A3	I understand that healthy lifestyle can prevent hypertension	1.08	0.6	0.14	Valid
A4	I understand that healthy lifestyle can make my body fit	1.02	0.2	0.31	Valid
A5	I understand that healthy life do not spend a lot of money	0.88	-0.7	0.49	Valid
A6	I understand that healthy lifestyle is not hard to apply	0.96	-0.2	0.44	Valid
A7	I understand that unhealthy lifestyle lead to hypertension risk	1.05	0.4	0.13	Valid
A8	I understand about hypertension risk if I do not practice healthy lifestyle	0.87	-0.8	0.42	Valid
<b>Awareness</b>					
B1	I have to do healthy lifestyle so I will not take hypertension medicine everyday	0.93	-0.2	0.42	Valid
B2	I have to do healthy lifestyle so I will not suffer from hypertension	1.00	0.1	0.35	Valid
B3	I am aware of the importance of healthy living	1.08	0.6	0.03	Valid
B4	I am aware to practice a healthy life	0.88	-0.5	0.44	Valid
B5	My healthy lifestyle can improve my performance	0.99	0.0	0.35	Valid
B6	I apply a healthy life to keep my body in shape	0.95	-0.2	0.49	Valid
B7	I am not forced to adopt a healthy lifestyle	0.95	-0.3	0.35	Valid
B8	I myself choose a healthy lifestyle	0.92	-0.5	0.40	Valid
<b>Self-intention</b>					
C1	I do not feel weird when practice a healthy lifestyle	0.66	-0.8	0.63	Valid
C2	I feel that my friends will not be ignore me for adopting a healthy lifestyle	1.03	0.2	0.15	Valid
C3	I'm sure I can live a healthy lifestyle	0.90	-0.6	0.39	Valid
C4	I feel confident I can live a healthy lifestyle	1.24	1.2	0.38	Valid
C5	I have the will to live a healthy lifestyle	0.84	-0.8	0.50	Valid
C6	I have no doubts about a healthy lifestyle	0.95	-0.2	0.41	Valid
C7	I love to do healthy lifestyle	0.97	-0.1	0.34	Valid
C8	Healthy lifestyle suits my hobby	0.87	-0.8	0.62	Valid
<b>Religion and belief</b>					
D1	I live a healthy life according to the religion I follow	0.83	-0.1	0.27	Valid
D2	I live a healthy life because I obey the religion I follow	1.00	0.0	0.26	Valid
D3	I sin if I adopt an unhealthy lifestyle	0.87	-0.8	0.52	Valid
D4	I get merit from my God if I adopt a healthy lifestyle	0.94	-0.3	0.50	Valid
D5	Healthy lifestyle suits my religion	1.01	0.1	0.35	Valid
D6	The religion that I follow teaches a healthy lifestyle	0.90	-0.6	0.39	Valid
<b>Self-control</b>					
E1	I can stop myself from following an unhealthy lifestyle	0.85	-0.4	0.57	Valid
E2	I can refuse if someone persuades an unhealthy lifestyle	1.35	1.7	0.42	Valid
E3	I am looking for the truth of the information about a healthy lifestyle that I received	0.83	-1.1	0.35	Valid
E4	I rechecked the information about a healthy lifestyle that I received	1.11	0.7	0.10	Valid
E5	I can judge the lifestyle that I apply is healthy or unhealthy	0.89	-0.5	0.45	Valid
<b>Social circle</b>					
F1	My friends apply a healthy lifestyle	1.04	0.3	0.61	Valid
F2	My friends persuade me to follow healthy lifestyle	0.92	-0.3	0.66	Valid
F3	My followers in social media apply a healthy lifestyle	0.88	-0.7	0.63	Valid
F4	Healthy lifestyle is trending today	1.06	0.4	0.72	Valid
F5	My daily activities support healthy life style	0.91	-0.5	0.43	Valid
F6	My idols practice a healthy lifestyle	0.86	-0.8	0.62	Valid
F7	Healthy lifestyle is cool in my social circle	0.95	-0.2	0.61	Valid
<b>Family condition</b>					
G1	I am used to living a healthy lifestyle at home	0.77	-0.6	0.51	Valid
G2	I often remind parents to adopt a healthy lifestyle	0.91	-0.4	0.48	Valid
G3	My parents told me about their hypertension disease	0.95	-0.3	-0.03	Valid
G4	My parents understand about a healthy lifestyle	0.97	-0.1	0.24	Valid
G5	My parents are aware of the importance of a healthy lifestyle	1.03	0.2	0.28	Valid
G6	Parents control and supervise my lifestyle is healthy or not	0.93	-0.4	0.26	Valid
G7	My parents have time to pay attention to my lifestyle is healthy or not	0.99	0.0	0.22	Valid
G8	My parents provide facilities so that I can adopt a healthy lifestyle	0.89	-0.6	0.43	Valid
G9	My parents are able to meet my needs so that I can adopt a healthy lifestyle	0.85	-0.9	0.45	Valid
G10	I have a good relationship with my parents	1.13	0.6	0.02	Invalid
G11	My parents care whether my lifestyle is healthy or unhealthy	1.11	0.7	0.01	Valid
G12	My parents live a healthy lifestyle	0.94	-0.3	0.27	Valid
G13	My parents encourage me to live a healthy lifestyle	0.91	-0.5	0.28	Valid
G14	My parents give me advice about healthy lifestyle	1.08	0.4	0.14	Valid
<b>School situation</b>					
H1	Teachers tell me about healthy lifestyle	0.98	0.1	0.26	Valid
H2	My teachers live a healthy lifestyle	0.98	0.0	0.35	Valid
H3	Healthy lifestyle is one of the topics of study in school	0.97	-0.1	0.35	Valid
H4	Schools provide facilities that support a healthy lifestyle	0.94	-0.3	0.33	Valid
H5	Schools make rules that encourage a healthy lifestyle	0.89	-0.7	0.37	Valid
<b>Neighborhood situation</b>					
I1	The government makes regulations that support a healthy lifestyle	0.94	-0.1	0.36	Valid
I2	The people around me care about a healthy lifestyle	1.12	0.7	0.34	Valid
I3	There are facilities that support a healthy lifestyle in the neighborhood around me	0.90	-0.6	0.42	Valid
I4	The people around me live a healthy lifestyle	0.84	-0.9	0.64	Valid
I5	My local traditions support a healthy lifestyle	0.90	-0.6	0.54	Valid
I6	The covid-19 pandemic encourages me to live a healthy lifestyle	0.86	-0.9	0.33	Valid
<b>Youth health service</b>					
J1	Health workers teach me a healthy lifestyle	0.84	-0.4	0.51	Valid
J2	Health workers encourage me to adopt a healthy lifestyle	1.10	0.1	0.44	Valid
J3	I get information dissemination about a healthy lifestyle	0.91	-0.6	0.41	Valid
J4	I got health information from health workers	1.06	0.4	0.55	Valid
J5	I was given an explanation about a healthy lifestyle from a health worker	0.97	-0.1	0.38	Valid
<b>Physical activity</b>					
K1	I go to school by walking or cycling	1.16	0.7	0.77	Valid
K2	During sport lessons, I am active in doing exercise	0.95	-0.2	0.23	Valid
K3	During breaks at school, I do activities such as sports that make me sweat	0.86	-0.9	0.48	Valid
K4	During break time at school, I just sit around (talking, eating, doing tasks)	2.04	4.3	0.29	Invalid
K5	I come home from school by walking or cycling	3.22	9.3	0.47	Invalid
K6	After school, I do physical activities such as sports (running, cycling, football, badminton, etc.)	1.00	0.0	0.74	Valid
K7	During my holidays, I do physical activities such as sports (running, cycling, football, badminton, etc.)	0.96	-0.1	0.53	Valid
K8	On holidays, I laze around all day	1.45	2.5	0.23	Invalid

(Contd...)

**Table 3: (Continued)**

Item code	Statement	Fit statistic			Interpretation
		MNSQ	ZSTD	Pt. Measure Corr.	
K9	In my spare time, I do physical activities such as sports (running, cycling, football, badminton, etc.)	0.94	-0.1	0.61	Valid
K10	In my spare time, I spend my time playing games, watching TV, social media, and sleeping	0.73	-1.6	0.46	Valid
<b>Dietary pattern</b>					
L1	I eat on time	1.05	0.3	0.14	Valid
L2	I skip breakfast	0.80	-1.2	0.15	Valid
L3	I eat 3 times a day (breakfast, lunch, dinner)	0.99	0.1	0.16	Valid
L4	I stop eating when I'm full	0.90	-0.4	0.41	Valid
L5	I consume fruits everyday	1.15	0.9	0.39	Valid
L6	I eat vegetables everyday	0.93	-0.3	0.53	Valid
L7	I snack before meal	0.65	-2.1	0.57	Invalid
L8	I snack between meals (morning, afternoon or evening)	0.90	-0.5	0.45	Valid
L9	I avoid eating sweet foods (candy, cake, chocolate, etc.)	0.82	-0.8	0.61	Valid
L10	I avoid eating salty foods (fish cake, fried foods, etc.)	1.03	0.3	0.59	Valid
L11	I avoid eating fast food (pizza, burger, sausage, etc.)	0.90	-0.6	0.51	Valid
L12	I avoid snacking street food	1.22	1.1	0.19	Invalid
L13	I bring lunch to school	0.97	-0.1	0.33	Valid
<b>Sleep habit</b>					
M1	I sleep regularly every day	1.68	1.1	0.04	Invalid
M2	I sleep more than 8 h every day	0.82	-0.7	0.52	Valid
M3	I sleep well every day	1.03	0.2	0.08	Valid
M4	I easily fall asleep at night	0.96	-0.2	0.43	Valid
M5	I stay up late at night	0.83	-1.0	0.19	Valid
M6	I wake up easily when I sleep at night	0.67	-2.0	0.58	Invalid
M7	I easily wake up in the morning	0.79	-0.7	0.41	Valid
M8	I'm sleepy while studying at school	0.72	-1.6	0.28	Invalid
M9	I feel tired when doing activities at school	0.75	-1.4	0.28	Invalid
<b>Emotional stress</b>					
N1	I easily concentrate when studying	2.37	3.0	0.08	Invalid
N2	I easily memorize lessons	1.20	1.1	0.32	Valid
N3	I finished the homework	1.14	1.0	0.15	Invalid
N4	I finished the homework on time	1.5	2.7	0.18	Invalid
N5	I easily forget everything	1.19	1.0	0.34	Valid
N6	I live my life happily	0.96	0.0	0.19	Valid
N7	I easily feel nervous or restless	0.68	-1.7	0.48	Valid
N8	I get angry or upset easily	0.59	-2.3	0.50	Invalid
N9	I feel bored with my life	1.08	0.5	0.09	Invalid
N10	I feel bored with my daily activities	0.79	-1.1	0.19	Invalid
<b>Smoking habit</b>					
O1	I am smoking	1.93	4.8	0.03	Invalid
O2	I refuse when persuaded to smoke	1.06	0.4	0.06	Valid
O3	I avoid talking to people who are smoking	0.91	-0.5	0.20	Valid
O4	I avoid hanging out with friends who are smoking	1.03	0.2	0.08	Valid
O5	I feel disturbed when there is cigarette smoke	1.13	0.7	0.10	Valid
O6	I feel disturbed when close to smokers	0.93	-0.4	0.27	Valid

MNSQ: Mean square, ZSTD: Standardized fit statistics, Pt. measure corr.: Point measure correlation.

is 0.95. The results of the reliability analysis are shown in Table 4.

**Table 4: Reliability analysis and separation for person and item**

Analysis	Person					Item				
	Logit value	INFIT	ZSTD	OUTFIT	ZSTD	Logit value	INFIT	ZSTD	OUTFIT	ZSTD
Mean	2.85	1.00	-0.2	1.01	-0.1	0.00	1.08	0.3	1.01	0.00
Separation	2.69					2.65				
Reliability	0.88					0.88				

MNSQ: Mean square, ZSTD: Standardized fit statistics, Pt. measure corr.: Point measure correlation.

Person-item map is used to describe the ability of respondents and the quality of the question items on the questionnaire. In Figure 1, it can be seen that respondents 04 are male, junior high school education level, and live in the city which are the respondents who have the most difficulty agreeing to the question items. In contrast, respondents 78 and 79 are male, elementary education level and residing in districts and cities, which are the two respondents who most readily agree with the question items. In Figure 2, it can be seen that codes A1, D1, L1, and M1 are the question items that are the easiest to agree with by respondents, while codes N7, N8, and N9 are the question items that are the most difficult for respondents to answer.

The Rasch model using principal component analysis showed that the raw variance explained by the measure was 20.1%, and the unexplained variance value did not exceed 15%. After the 17 invalid question

items were removed, unidimensionality analysis was carried out again; the raw variance explained by measure value was 72.3%, and the unexplained variance value did not exceed 15%. This shows that the instrument is unidimensional, so it can measure the attributes that are intended to be measured, because the minimum requirement of 20% unidimensionality has been met.

In the instrument used, five answer choices were given in the form of a Likert rating for each question item (from a range of strongly disagree to agree strongly, and from a range of never to very often). From the analysis results, Table 5 shows that the observed average starts from a logit value of 1.15 for choice 1 (strongly disagree or never) and increases to logit 3.12 for choice 5 (strongly agree or very often). It can be seen that between choices 1, 2, and 3, there was no increase in the logit value, but it decreased, which showed that the respondent could not be sure of his choice and was supported by the Andrich Threshold value in an unordered table.

**Table 5: Rating scale test value**

Category label	Observed average	Andrich threshold
1	1.15	None
2	0.64	-0.57
3	0.53	0.10
4	2.36	-1.40
5	3.12	1.87

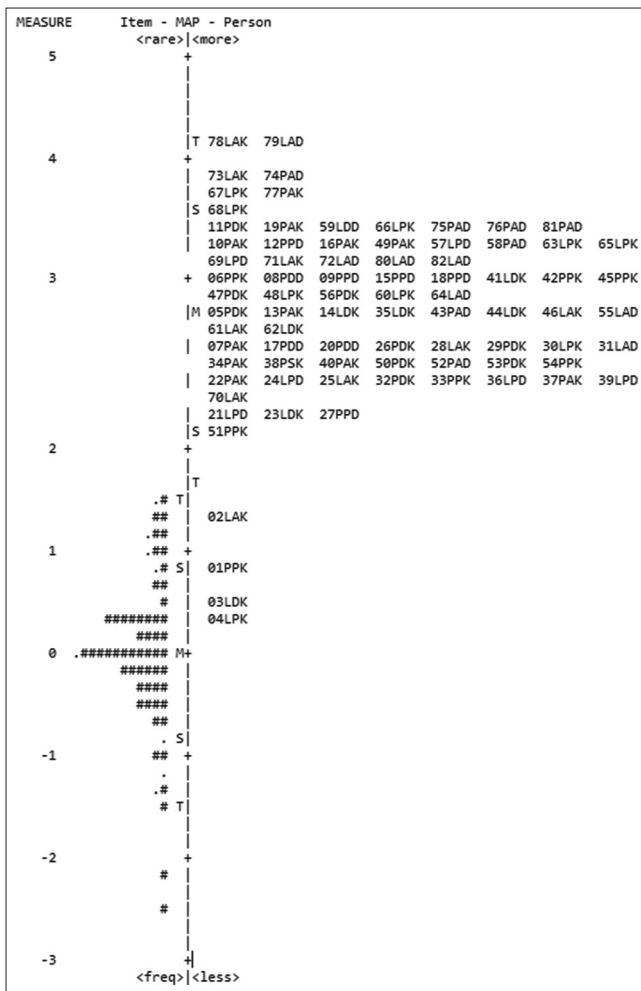


Figure 1: Person's map

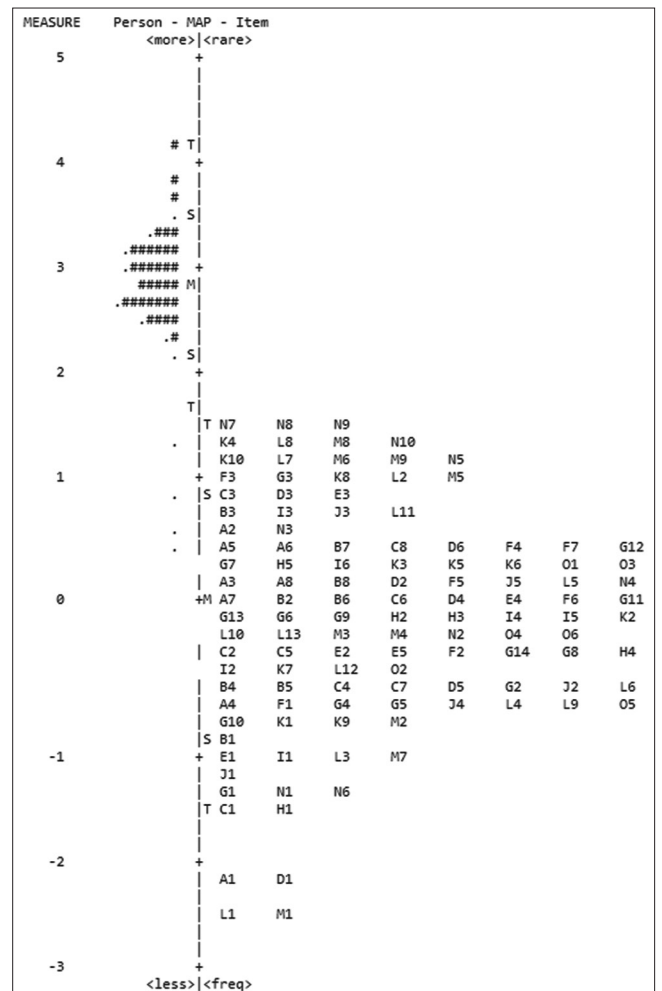


Figure 2: Item map

The instrument in this study was a questionnaire consisting of 15 variables with 120 question items developed from three main elements of establishing a healthy lifestyle in adolescents with a family history of hypertension based on the results of the previous qualitative research. This instrument was developed to assess the factors for establishing a healthy lifestyle in adolescents with a family history of hypertension.

Based on the Rasch Model, the validity of the overall question items refers to fit items and misfits using the outlier-sensitive mean square (OUTFIT MNSQ) value, standard Z score (ZSTD), and Point Measure Correlation (Pt Mean Corr). The item is said to be fit if the OUTFIT value is  $0.5 < \text{MNSQ} < 1.5$ ;  $-2.0 < \text{ZSTD} < 2.0$ ; and the Pt Mean Corr value is in the range of  $0.32 < \text{Pt Measure Corr} < 0.85$ . There are 17 invalid question items. After consideration, these items were finally deleted, bringing the total number of question items to 103 [12], [13].

The reliability value of respondents and instruments above 0.8 means that the respondents who filled out the questionnaires have consistently provided answers, and the quality of the question items in the instrument is good. The respondent's separation value which is rounded up to 3 shows that there are three types of respondent groups ranging from the easiest

to agree with to the most difficult to agree to have represented this pilot test. Cronbach's alpha value is also outstanding, which is above 0.8, indicating that the interaction between respondents and the questions is very good [10], [12].

The unidimensionality of the instrument is an important measure to evaluate whether the developed instrument can measure what it is supposed to measure. The Rasch model analysis uses principal component analysis of the residuals, which measures the extent to which the diversity of the instrument measures what it is supposed to measure. The unidimensionality requirement is that the raw variance explained by the measure is at least 20%, and the unexplained variance value does not exceed 15% [11], [12].

Rating scale validity analysis is a test to verify whether the rating scale used is confusing for respondents. Rasch model analysis provides a verification process for the rating assumptions given in the instrument [14]. Andrich Threshold is to test whether the value of the polytomy used is correct or not [15], [16], [17]. The Andrich Threshold value, which moves from none to negative and continues to lead to positive sequentially, indicates that the given option is valid for the respondent. However, in Table 5, it

looks not sequential. Therefore, the choice of options for this instrument should be simplified into three options, namely, choice 1 (disagree or never), choice 2 (undecided or sometimes), and choice 3 (agree or often).

## Conclusions

We conclude that the healthy lifestyle instruments are valid and reliable, so it is feasible to measure the healthy lifestyle of Indonesian adolescents with a family history of hypertension. This instrument can measure the success of a program or intervention in changing a lifestyle in adolescents at risk of developing hypertension, especially adolescents with a family history of hypertension. We suggest further research involving more participants in a broader area. We hope the healthy lifestyle instruments can be used in a standardized manner for all regions of Indonesia.

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