Instruments to Measure Health Literacy among Children: A Scoping Review

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ABSTRACT

Background: Research related to health literacy among children is limited due to the lack of appropriate measurement tools for this population. The measurement tools used to measure health literacy among children are usually adapted from the adult versions. Researches related to instruments measuring health literacy that can be used for children in school environments are inadequate. This study aimed to synthesize research on the instruments that measure health literacy among children in the community setting.

Method: We carried out a scoping review to synthesize research on the instruments measuring health literacy among children in the community setting. The article searching process was targeted to collect articles with corresponding populations, concepts, and contexts. The search was conducted through PubMed, ProQuest, ScienceDirect, and Sage Journals databases published between 2010-2020. The selection process was done using Preferred Reporting Items for Systematic Reviews and Meta-Analyses methods (PRISMA). The following critical appraisal used The Joanna Briggs Institute checklist.

Results: Out of 328 studies, six articles were selected for this review. Consensus showed that health literacy needs to be applied in various situations. Improving the health literacy of children in the early stages is crucial for children's development and personal health. Several instruments can be applied to measure health literacy in school-age children, such as Health Literacy Measures for Adolescents, Health Literacy for School-aged Children in the English, Turkish and Lithuanian versions, and Chinese version of the eight-item Health Literacy Assessment Tool. Generally, the instruments are adequate, while only two instruments in this study are inadequate because they do not describe the validity and reliability.

INTRODUCTION

Health literacy as an emerging issue in the discussion about health has a variety of meanings. Health literacy defined the topic as an understanding and a skill to digest information. People decide about types of healthcare, health promotion, and prevention of diseases that they will apply to improve their life quality1. Another similar meaning defining health literacy, especially in children, explained that children's conception of health literacy determines how they understand health guidance and other health-related information2. For this study, we defined children using the definition by the World Health Organization (WHO). It defines children as persons aged 19 years or younger1.

Children are the core target groups for health literacy interventions because they are undergoing primary physical, emotional, and cognitive development in the childhood and adolescence phases. Besides, there are changes in behavior and skills that are developing within this age group. Therefore, these life stages are considered essential for one's healthy development and personal well-being and one's health for years to come. A high rate of health literacy in children can help them to exercise healthy behaviors that will be beneficial to lessen health risks in the future3.

Nowadays, there is no consensus concerning a gold standard for the measurement of health literacy5. Some earlier standards had deficiencies such as not comprehensively evaluating the components of each health literacy measurement instrument6. Research reviews have tried to summarize the components of each instrument for health literacy measurements; however, the explanations were inadequate, and most were descriptive without a satisfying critical valuation7,8. None of these reviews considered the methodological quality of the reviewed studies. The lack of assessment on the quality of research...
 rais es questions about the usefulness of these reviews to measure and select proper health literacy measurements. This is an important issue before intervening in patients’ health; health workers need to assess the patients using valid and reliable instruments. 

Research related to child health literacy is still limited due to the lack of measurement instruments for this population. Most of the time, measurement instruments applied to measuring child health literacy are derived from its adult version. In addition, many of the studies focusing on child health literacy are only examining children’s medical conditions. Furthermore, only a small number of studies have tried to measure child health literacy, not in a clinical environment, such as schools. Researches related to instruments measuring health literacy in adults are common. However, studies related to instruments measuring health literacy that can be used for children in the school environment are far from adequate. This review aimed to identify any instruments that can be utilized to measure health literacy related to health behavior in children to bridge the gap.

METHOD
Design and search methods

The references for this literature review come from four databases: PubMed, ProQuest, ScienceDirect, and Sage Journals published between 2010 to 2020. The searching process of this review used specific clinical questions, abbreviated as PCC [population (P), concept (C), and content (C)]. The population was children; the concept was an instrument measuring health literacy related to health behavior; and the context was studies conducted in the community setting. We used several keywords for Boolean searching: instrument AND health literacy AND health behavior AND school-age children AND community. The article selection in this study followed the method called Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [11].

Inclusion and exclusion criteria

The references included in this study were articles: (1) published in 2010-2020; (2) published in English; (3) in which the subjects are children; (4) describing health literacy instrument; (5) used in a community setting, i.e., school; and (6) which are original or research articles with quantitative or qualitative methods. However, articles discussing health literacy in children with a mental health disorder excluded from this study. All authors did both the first screening and content analysis.

Quality appraisal

Before the quality appraisal, the author team read six selected full texts. Once the team finished reading the articles, the team conducted critical appraisal using The Joanna Briggs Institute (JBI) critical appraisal checklist for analytical cross-sectional studies and qualitative research. The method uses several criteria to value the quality of articles to decide whether they can be processed in the synthesis phase or not. These criteria including samples and subjects of researches, research measuring instrument validity and reliability, confounding factors, and statistical analysis. There were no excluded studies based on this quality assessment.

Data Extraction and analysis

Within this stage, the six articles were extracted and analyzed to identify their author(s), year of publication, country of origin, aims, population and sample size, outcomes measurements (method), and important findings following the review questions [12].

RESULT AND DISCUSSION

Search outcome

We yielded 328 articles consist of 27 articles from PubMed, six from ProQuest, 152 from ScienceDirect, and 143 from Sage Journals. There were two duplicate articles, leaving the remaining 326 articles. Then, the screening process with the inclusion and exclusion criteria was done on the article's title and abstract, and only 15 articles matched with the criteria. At the final stage, only six articles were included for this study (see Figure 1).

Descriptive characteristics of the studies

Six selected studies were recently published, from 2016 to 2019. The studies were conducted in several countries such as Iran, Turkey, Finland, China, Lithuania [13-18]. Characteristics of the study is shown in Table 1.

Five studies in this review used a cross-sectional study design, and the other one study used a cross-sectional and qualitative research design using in-depth interviews [16]. The respondents in the studies ranged from 11 to 18 years, and most were students of various selected schools. In general, the studies aimed to develop and evaluate the instrument related to health literacy in children [14,16,17]. Other studies compared health literacy in children who engaged in certain physical activities such as sports [15]. In addition, several studies show the correlation of health literacy to school performances, learning intricacies, educational targets, family affluence, and health education in schools [13,19] as shown in Table 2.

Measuring health literacy instruments

There are several instruments used to measure health literacy, i.e., Health Literacy Measure for Adolescents (HELM), Health Literacy for School-aged Children
(HLSAC) in English, Turkish and Lithuanian versions; and the Chinese version of the eight-item Health Literacy Assessment Tool (c-HLAT-8) as shown in Table 3. Generally, these instruments are inadequate, and two are considered poor instruments because they are unable to explain the validity and the reliability of the instrument to measure child health literacy (as shown in Table 4.)

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**Figure 1. Study selection process**
Table 1. General information of the six included studies

| No | Author(s)       | Year of Publication | Country of Origin | Continent        |
|----|-----------------|---------------------|-------------------|------------------|
| 1  | Ghanbari et al. | 2016                | Iran              | Asia             |
| 2  | Paakkari et al. | 2017                | Finland           | Europe           |
| 3  | Haney           | 2018                | Turkey            | Asia and Europe  |
| 4  | Paakkari et al. | 2018                | Finland           | Europe           |
| 5  | Guo et al.      | 2018                | China             | Asia             |
| 6  | Sukys et al.    | 2019                | Lithuania         | Europe           |

Table 2. Summary of the included studies

| No | Authors, year | Purpose                                                                                                                                                                                                 | Design                                         | n    | Setting                                                                 | Study population                                      |
|----|---------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|------|------------------------------------------------------------------------|-------------------------------------------------------|
| 1  | Ghanbari et al., 2016 | Developing and evaluating the psychometric properties of an measurement instrument to measure adolescent health literacy (the Health Literacy Measure for Adolescents-HELMA) | Qualitative (in-depth interviews) and quantitative (Cross-sectional) | 717  | The selected high school in Tehran, Iran | Students aged 15–18 years |
| 2  | Paakkari et al., 2017 | Comparing the levels of perceived health literacy among adolescents who do or do not participate in sports club activities | Cross-sectional                                | 3.852 | Selected schools in Finland | School children aged 13 and 15-year-old |
| 3  | Haney, 2018    | Assessing the validity and reliability of the Turkish version of the Health Literacy for School-Aged Children (HLSAC-T) scale | Cross-sectional                                | 563   | Two junior high schools and two senior high schools in Izmir, Turkey | Students with the mean age 13.67 (SD 1.54)           |
| 4  | Paakkari et al., 2018 | Investigating the level of subjective health literacy among adolescents based on the HLSAC instrument and determining the associations between health literacy, school performances, learning impediments, educational goals, and family welfare. | Cross-sectional                                | 3.833 | Selected schools in Finland | Students aged 13 and 15-year-old                      |
| 5  | Guo et al., 2018 | Adopting a skill-based and three-domain (functional, interactive, and critical) instruments to assess adolescent health literacy in China and examining the status and determining factors of each domain. | Cross-sectional                                | 650   | Secondary schools in two district of Beijing | Students aged 11-17 years                             |
| 6  | Sukys et al., 2019 | Determining the level of subjective health literacy among adolescents in Lithuania and examining the correlations of health literacy, school performances, health education in schools, and family welfare | Cross-sectional                                | 2.369 | General schools in Lithuania | Students aged 13-16 years                             |
# Table 3. Instrument characteristics of the studies

| Tool                                                      | Reference          | Focus                                                   | Intended respondents | Scale construction                                                                 |
|-----------------------------------------------------------|--------------------|---------------------------------------------------------|----------------------|-------------------------------------------------------------------------------------|
| Health Literacy Measure for Adolescents (HELMAs)          | Ghanbari et al., 2016 | To measure health literacy among adolescents          | Adolescents aged 15-18 years | Self-completed; 8 subscales i.e., access (5 items), reading (5 items), understanding (10 items), appraisal (5 items), use (4 items), communication (8 items), self-efficacy (4 items), and numeracy (3 items). Total of 44 items. |
| Health Literacy for School-aged Children (HLSAC)          | Paakkari et al., 2017 | To measure health literacy among school-aged children   | School-aged children  | HLSAC includes 10 items focusing on theoretical knowledge, practical knowledge, critical thinking, self-awareness, and citizenship. |
| Turkish version of the Health Literacy for School-Aged Children (HLSAC-T) | Haney, 2018            | To measure subjective health literacy of school children | School-aged children  | HLSAC-T adapted from HLSAC includes 10 items that focus on theoretical knowledge, practical knowledge, critical thinking, self-awareness, and citizenship. |
| Health Literacy for School-aged Children (HLSAC)          | Paakkari et al., 2018 | To measure the adolescents’ subjective (self-reported, perceived) health literacy | School-aged children  | HLSAC includes 10 items instrument, derived from 5 core components (each containing 2 items) i.e., theoretical knowledge, practical knowledge, critical thinking, self-awareness, and citizenship. |
| Chinese version of the eight-item Health Literacy Assessment Tool (c-HLAT-8) | Guo et al., 2018      | Measuring adolescent health literacy in Chinese secondary schools | Adolescents in secondary school | The c-HLAT-8 includes 8 items to measure three domains -functional, interactive and critical health literacy. The total score ranges from 0 to 37, with higher scores indicating higher levels of health literacy |
| Lithuania version of Health Literacy for School-aged Children (HLSAC) | Sukys et al., 2019   | Measuring subjective health literacy of school children | School-aged children  | The HLSAC instrument utilize ten items related to the theoretical and practical knowledge, critical thinking, self-awareness, and citizenship |
### Table 4. Detailed assessment of the overall utility of the included instruments

| Tool                                      | Reference                    | Availability                                                                 | Clinical utility                                                                 | Reliability                                                                 | Validity                                                                 | Overall utility | Interpretation                                                                 |
|-------------------------------------------|------------------------------|------------------------------------------------------------------------------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------|--------------------------------------------------------------------------|-----------------|--------------------------------------------------------------------------------|
| Health Literacy Measure for Adolescents-HELMA | Ghanbari et al., 2016       | Information of measurement instrument items is shown in the study.          | The instrument is deemed easy to administer.                                   | The Cronbach’s alpha coefficient for the entire scale was 0.93, ranging from 0.61 to 0.89 for various domains. The intraclass correlation coefficient (ICC = 0.93). | Adequate                                                                 | The article does not describe the interpretation of the instrument. HELMA can be filled by adolescents within 15 minutes. |
| Health Literacy for School-aged Children (HLSAC) | Paakkari et al., 2017       | List of instrument items is not available in the study. However, the study describes the assessment of items used Likert scale: 1 = not at all true, 2 = barely true, 3 = somewhat true, and 4 = absolutely true. | Scoring and interpretation are deemed easy.                                   | Cannot tell                                                                 | Cannot tell                                                              | Poor because the study did not examine the validity and reliability of the instruments. | Interpretation of the instruments i.e., low (score 10–25), moderate (score 26–35), and high (score 36–40). HLSAC reported by the children. |
| Turkish version of the Health Literacy for School-Aged Children (HLSAC-T) | Haney, 2018                  | Information of measurement instrument items is shown in the study.          | Instrument is easy to administer, score and interpret.                        | Cronbach’s alpha for the scale was .77 and item-total correlations were between .49 and .61 (p < .001). | Adequate                                                                 |                 | The minimum and maximum score were 10 and 40, respectively. The higher score indicating the health literacy of students. HLSAC-T reported by the students during school hours in the classrooms. |
| Health Literacy for School-aged            | Paakkari et al., 2018       | List of instrument items is available in the study.                         | Instrument is easy to administer, score                                       | The HLSAC instrument has high                                               | Adequate                                                                 |                 | HLSAC categorized into 3 levels i.e low = score 10-25,                       |
| Instrument                                                                 | Authors                         | Information of measurement instrument items | Instrument is easy to administer, score and interpret. | Internal consistency (overall Cronbach’s α 0.93) | Contains 2 items from each of the 5 core components. | Adequacy                                                                 | muscular = score 26-35, high = score 36-40. HLSAC is self-reported instrument by the children. |
|--------------------------------------------------------------------------|---------------------------------|-----------------------------------------------|------------------------------------------------------|-------------------------------------------------|------------------------------------------------|--------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|
| Children (HLSAC)                                                        |                                 |                                               |                                                      |                                                 |                                                 | Adequate                                                                 | The total score range is 0-37. Higher score of c-HLAT-8 indicating higher levels of health literacy. It was self-administer questionnaire by adolescents in-class time. |
| Chinese version of the eight-item Health Literacy Assessment Tool (c-HLAT-8) | Guo et al., 2018               | Information of measurement instrument items is shown in the study. | Instrument is easy to administer, score and interpret. | c-HLAT-8 had satisfactory reliability (Cronbach’s α = 0.79; intra-class correlation coefficient = 0.72) | Strong validity (translation validity index (TVI) ≥0.95; χ²/df = 3.388, p < 0.001; comparative fit index = 0.975, Tucker and Lewis’s index of fit = 0.945, normed fit index = 0.965, root mean error of approximation = 0.061. | Adequate                                                                 | The total score range is 0-37. Higher score of c-HLAT-8 indicating higher levels of health literacy. It was self-administer questionnaire by adolescents in-class time. |
| Lithuania version of Health Literacy for School-Aged Children (HLSAC)    | Sukys et al., 2019              | List of instrument items is not available in the study. However, the study describes the assessment of items used 4-point Likert-type scale. | Scoring and interpretation are easy.                | Cronbach’s alpha value was 0.88.                | Cannot tell                                      | Poor because the study did not describe the validity of the instrument. | Health literacy levels described into 3 levels as low (score 10-25), moderate (score 26-35), and high (score 36-40). The instrument reported by the children. |
Health literacy needs to be applied in various situations. Improving the health literacy of children in the early stages is crucial for the development and personal health of children. Children are selected to become the primary study focus for health literacy study and intervention since within this age group, the processes of fundamental physical, emotional, cognitive development and health-related behaviors and skills mature. Because children usually spend a significant portion of their time at school, strengthening their comprehension concerning health literacy as a school learning outcome that includes a variety of knowledge and competencies will foster them to make a better understanding for themselves, other people, and the dynamics of the world. Importantly, this health literacy will also make them better able to make health decisions.

Measurement of health literacy in school-age children can use several instruments. Six selected instruments were found to have adequate overall utility, while the other two were observed to have poor overall utility. Health Literacy Measure for Adolescents (HELMA), which aims to measure health literacy among adolescents, is constructed by 44 parameters within eight categories. These categories are: 1) access, 2) reading, 3) understanding, 4) appraisal, 5) use, 6) communication, 7) self-efficacy, and 8) numeracy. Many researchers have indicated that overall, HELMA has been proven to perform appropriate validity and reliability.

Health Literacy for School-aged Children (HLSAC) which is widely used to measure health literacy among school-aged children utilizes 10 items in total which are derived from 5 core components; they are 1) theoretical knowledge, 2) practical knowledge, 3) critical thinking, 4) self-awareness, and 5) citizenship. To measure literacy, HLSAC uses a scoring and scaling system, with a minimum score of 10 and a maximum score of 40. From many observations, HLSAC has performed with an adequate overall utility because its ten parameters have high internal consistency and validity. This instrument has been translated into Turkish and Lithuanian versions. In the Turkish version, the use of HLSAC-T resulted in reliable and valid data. However, in the Lithuanian version, the study was not completed with any description of the instrument's reliability and validity. The ten items are assessed on a four-point Likert-type scale. The original HLSAC is assumed to be easy to administer, score, and interpret.

The Chinese version of the eight-item Health Literacy Assessment Tool (c-HLAT-8), designed to measure adolescent health literacy in Chinese secondary schools, has been proven to have adequate overall utility. It has satisfactory reliability and strong validity. The c-HLAT-8 includes eight parameters to measure health literacy in three overall construct areas: 1) functional, 2) interactive, and 3) critical. The total score ranges from 0 (minimum) to 37 (maximum). The higher scores suggest better levels of health literacy. Based on the analysis of the determinants of c-HLAT-8, overall health literacy is highly correlated with adolescent's self-efficacy, social supports that they acquired, and their perceptions of school environments. Similar to HLSAC, this instrument considered easy to administer, score, and interpret.

Simple and short measurement tools available and able to assess student health literacy in many ways can provide an excellent opportunity for researchers, clinicians, and health professionals to analyze the results of their research conducted with a larger sample of the study. Involving the students in the research by encouraging them to self-measure and self-report their health data is also an excellent way to enhance their skills in discussions of basic health literacy. School is an appropriate environment to support health literacy since it can provide engagement with almost all populations, including teachers, administrators, and peers in a similar age group. In general, the development of health literacy, health behavior, and healthy well-being take place during childhood and schoolhood period.

Based on the above findings, HLSAC is among many health literacy measurement instruments that have been translated into several languages and are used in several countries, such as Turkey and Lithuania. HLSAC-T can be confidently applied by health professionals to assess health literacy and many factors that determine children's health literacy.

CONCLUSION

Several instruments have been developed that can measure health literacy in school-aged children i.e., Health Literacy Measures for Adolescents (HELMA), Health Literacy for School-aged Children (HLSAC) in English, Turkish and Lithuanian versions, and the Chinese version of the eight-item Health Literacy Assessment Tool (c-HLAT-8). In general, these instruments are adequate, while two instruments in this study are considered inadequate because they did not describe their validity and reliability.

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Conflicts of Interest

The authors declare that there is no existing conflict of interest in this review.
REFERENCES

1. Tomás CC, Oliveira E, Sousa D, Uba-Chupel M, Furtado G, Rocha C, et al. Proceedings of the 3rd IPLeiria’s International Health Congress. BMC Health Serv Res. 2016 Jul;16(S3).
2. Velardo S, Drummond M. Emphasizing the child in child health literacy research. J Child Heal Care. 2017;21(1):5–13.
3. The Ministry of Health of the Republic of Indonesia. INFO DATIN The Ministry of Health of the Republic of Indonesia Conditions of Achievement of the Indonesian Child Health Program. Data and Information Center. 2014. 12 p.
4. Bröder J, Okan O, Bauer U, Bruland D, Schlupp S, Bollweg TM, et al. Health literacy in childhood and youth: A systematic review of definitions and models. BMC Public Health. 2017;17(1):1–25.
5. Guo S, Armstrong R, Waters E, Sathish T, Alif SM, Browne GR, et al. Quality of health literacy instruments used in children and adolescents: A systematic review. Vol. 8, BMJ Open. BMJ Publishing Group; 2018.
6. Ormshaw MJ, Paakkari LT, Känchas LK. Measuring child and adolescent health literacy: A systematic review of literature. Health Educ. 2013;113(5):433–55.
7. Perry EL. Health literacy in adolescents: An integrative review. J Spec Pediatr Nurs. 2014;19(3):210–8.
8. Okan O, Lopes E, Bollweg TM, Bröder J, Messer M, Bruland D, et al. Generic health literacy measurement instruments for children and adolescents: a systematic review of the literature. BMC Public Health. 2018 Jan;18(1):166.
9. Schmidt CO, Fahlund RA, Franze M, Spleth C, Thyrion JR, Plachta-Danielzik S, et al. Health-related behaviour, knowledge, attitudes, communication and social status in school children in Eastern Germany. Health Educ Res. 2010;25(4):542–51.
10. Wu AD, Begoray DL, MacDonald M, Wharf Higgins J, Frankish J, Kwan B, et al. Developing and evaluating a relevant and feasible instrument for measuring health literacy of Canadian high school students. Health Promot Int. 2010;25(4):444–52.
11. Pati D, Lorusso LN. How to Write a Systematic Review of the Literature. Heal Environ Res Des J. 2018 Jan;11(1):15–30.
12. Peters MDI, Godfrey CM, Khalil H, McInerney P, Parker D, Soares CB. Guidance for conducting systematic scoping reviews. Int J Evid Based Healthc. 2015 Sep;13(3):141–6.
13. Paakkari O, Torppa M, Villberg J, Kännäs L, Paakkari L. Subjective health literacy among school-aged children. Health Educ. 2018;118(2):182–95.
14. Haney MO. Psychometric testing of the Turkish version of the Health Literacy for School-Aged Children Scale. J Child Heal Care. 2018;22(1):97–107.
15. Paakkari L, Kokko S, Villberg J, Paakkari O, Tynjälä J. Health literacy and participation in sports club activities among adolescents. Scand J Public Health. 2017 Dec;45(8):854–60.
16. Ghanbari S, Ramezankhani A, Montazeri A, Mehrabi Y. Health literacy measure for adolescents (HELMA): Development and psychometric properties. PLoS One. 2016 Feb;11(2).
17. Guo S, Davis E, Yu X, Naccarella L, Armstrong R, Abel T, et al. Measuring functional, interactive and critical health literacy of Chinese secondary school students: reliable, valid and feasible? Glob Health Promot. 2018 Dec;25(4):6–14.
18. Sukys S, Trinkuniene L, Tiliindiene I. Subjective health literacy among school-aged children: First evidence from Lithuania. Int J Environ Res Public Health. 2019 Sep;16(18).
19. Sukys S, Trinkuniene L, Tiliindiene I. Subjective Health Literacy among School-Aged Children: First Evidence from Lithuania. Int J Environ Res Public Health. 2019 Sep;16(18).
20. Manganello JA. Health literacy and adolescents: A framework and agenda for future research. Health Educ Res. 2008;23(5):840–7.