





REVIEW

Public Health

Health literacy and obesity: A systematic scoping review

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Summary

Obesity is a preventable global health epidemic that has serious health consequences. Health literacy has been identified as an underlying and modifiable factor in the development and maintenance of obesity. Adequate levels of health literacy have been shown to significantly impact on weight loss, weight loss maintenance, and associated health outcomes.

Objective: The aim of the current study was to systematically review extant literature to evaluate the way in which health literacy is measured for individuals with obesity and to identify the key areas of health literacy that are commonly assessed.

Method: This systematic scoping review was conducted over five databases and yielded 12 papers ($N_{\text{participants}} = 15,393$) that represented our search strategy and inclusion and exclusion criteria.

Results: The review highlighted there are currently multiple measures that exist that assess independent or dual domains of health literacy; however, there were no studies that specifically utilized a measure that holistically assessed the three maintaining and modifiable domains of health literacy of obesity (psychological knowledge, nutritional knowledge, and knowledge about physical activity).

Conclusion: Given the dearth of targeted health literacy measures for obesity, our findings highlighted a critical need to develop a distinct measure of health literacy for obesity to guide policy, research, education, and intervention.

KEYWORDS

disordered eating, health literacy, measures, obesity

1 | INTRODUCTION

Obesity is a major preventable but growing global health problem.^{1,2} Previous literature has shown that individuals with obesity experience disordered eating behaviors (DEB) and/or eating disorders (ED).³ DEB are defined as problematic eating patterns that occur at a lower severity compared to an ED; and, if left untreated, can develop into an ED.⁴ The lifetime prevalence of DEB and ED in individuals with

obesity can range between 4%–47%.^{5–7} Binge-eating, grazing, dietary restraint/restriction, compensatory behaviors, and emotional eating are commonly observed DEB in people with obesity.^{3,8–10} Similar to obesity, the mixed treatment outcomes and the complex nature of disordered eating places a significant economic burden on the Australia health system.^{11,12} Further, environmental factors (e.g., media), nutritional factors (e.g., caloric intake, dietary choices), lifestyle factors (e.g., physical inactivity), medical factors

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(e.g., hormonal abnormalities, medication side effects, physical disability), and social factors (e.g., access to resources, socioeconomic status) are key areas that may be implicated in the development and maintenance of obesity and DEB.^{13–22}

The Clinical Obesity Maintenance Model (COMM) is a psychological model of the maintenance aspects of obesity,²³ which emphasized the role of DEB and health literacy as maintaining (i.e., perpetuating) and modifiable (i.e., changeable) constructs.^{23–25} Health literacy is defined as the way that individuals comprehend, access, and use health information to improve their own and others well-being.²⁶ Research suggests that higher levels of health literacy are associated with higher levels of overall physical and mental health, better treatment and social outcomes, and healthier lifestyle decisions.^{25,27–29} Conversely, lower levels of health literacy may contribute to poorer outcomes such as higher body weight, unhelpful weight loss strategies (e.g., DEB), and less informed choices about weight loss interventions.²⁴

Improving health literacy through psychoeducation is a core component for treatment of ED and weight management.^{30–32} Although several studies have attempted to create weight-related health literacy measures in specific populations,^{33–35} there are currently no empirically validated measures assessing the health literacy of people living with obesity and DEB in the general population. Consequently, it is difficult to discern the key areas of health literacy that warrant intervention, particularly because of the multifactorial nature of health literacy and obesity. Further, although existing health literacy measures (e.g., Health Literacy Questionnaire [HLQ])³⁶ provide researchers and clinicians with a broad understanding of an individual's health literacy, key aspects relating to obesity could be inadvertently omitted without a tailored measure. Further, having a specific measure for people with obesity could provide increased insight into the domains of health literacy that relate to the development and maintenance of obesity. For the purpose of this study, we have attempted to streamline the multifactorial, modifiable, and maintaining factors relating to obesity into three categories of health literacy, including knowledge of nutrition, psychological factors, and physical activity.³⁷ Within each domain, we aimed to collect data on navigational, interactive, and functional aspects of health literacy.

Existing research in this field has found that lower levels of nutritional literacy, including the ability to read and understand food labels and estimate portion sizes, contributes to DEB and obesity.^{38,39} Similarly, studies have found that lower levels of physical activity correlate with higher weight across the lifespan,^{40,41} with research suggesting that adults who improve their overall health literacy, tend to engage in more physical activity,⁴² which in turn may decrease the burden of disease obesity places.⁴² Correspondingly, improving mental health literacy (e.g., adverse childhood events, body image, depression, and anxiety) and understanding of social factors (e.g., impacts of social media, access to services) may increase self-efficacy, readiness to change, and improve outcomes relating to weight loss.^{43–45}

Several measures on nutritional literacy (e.g., Food and Nutrition Literacy, the Nutrition Literacy Scale), physical activity (e.g., Global Physical Activity Questionnaire), and psychological literacy (e.g., Mental Health Knowledge Questionnaire) have been developed,

which examine knowledge about reading food labels and making food choices, eating behaviors, general mental health, and overall physical activity levels. However, these measures do not explicitly assess health literacy in the context of obesity. To our knowledge, such measures have not been developed.

While improving health literacy across various domains would likely enhance social, psychological, nutritional, and physical health and treatment outcomes,^{25,27–29} it is critical to first comprehensively understand how health literacy is currently being measured in the literature. Therefore, the current study aimed to systematically review extant literature to evaluate the way in which health literacy is measured for individuals with obesity and to identify the key areas of health literacy that are commonly assessed.

2 | METHOD

2.1 | Protocol and registration

This systematic scoping review applied PRISMA-ScR procedures⁴⁶ and was registered with PROSPERO (CRD42023441814).

2.2 | Eligibility criteria

2.2.1 | Population

Eligible studies included participants of all ages with a BMI ≥ 30 kg/m² and/or studies that indicated recruiting participants with obesity. A broad age range was included in this review because health literacy is a modifiable construct that is relevant across all ages.

2.2.2 | Outcome

The primary outcome of interest for this review was examining how health literacy is measured throughout the clinical literature, and the extent to which existing measures evaluate multiple domains of health literacy (i.e., psychological, nutritional, and physical). Eligible studies contained empirically validated measures relating to obesity, eating behaviors, or health literacy.

2.2.3 | Study design

Observational study designs such as cohort studies and cross-sectional studies were eligible for this review. Intervention studies were excluded from this review as we were interested in the measures used, rather than the effectiveness of the intervention implemented. Meta-analysis, study protocol, and case studies/series, and other forms of reviews were excluded. Studies with a small sample size ($n < 25$) were also excluded. This review focused on studies published from 2013 to 2023. This date range was implemented as binge-

eating disorder was introduced in the Diagnostic and Statistical Manual-fifth edition (DSM-5).⁴⁷

2.3 | Search strategy

A systematic search of the electronic databases PsycINFO, Web of Science, Scopus, Medline, and Embase was completed. Search limiters included the English language, human research, peer-reviewed journal articles, and adult, child, and adolescent participants. The search strategy focused on title, abstract, and keywords in each database on the three key topics of eating behaviors, health literacy, and obesity (see Table S1). This search covered studies published from 2013 to February 2023, which was the last time point the databases were searched. The search included 2013 as the start point as this was when DSM-5 was published and included BED.

2.4 | Study selection

The authors (A.U., M.C., N.S., O. W, and D.S.) collaboratively completed the study selection process. Initially, the studies ($N = 3150$) identified through the database search were screened for duplicates, and the duplicates ($n = 580$) were subsequently removed through Covidence.⁴⁸ The title and abstracts of the remaining studies ($n = 2570$) were screened, and any nonrelevant studies ($n = 2516$) were removed. The full text of the remaining studies ($n = 54$) was assessed for suitability and relevance (see Figure S1). The final studies ($N = 12$) in this review were agreed upon by all authors. Exclusion criteria were established to aid with the study selection process and included: intervention studies, any types of reviews, case studies or series, studies with small samples (<25), study protocols, and studies including samples with a BMI ≤ 30 and/or studies that indicated not recruiting participants with obesity.

2.5 | Risk of bias assessment

For each included study, two authors (A.U. and D.S.) independently completed the quality assessment tool for observational and cross-sectional studies.⁴⁹ This tool consists of 14-items that assess the risk of selection bias and internal validity of each selected study. Each author evaluated studies according to the items and provided an overall rating. Disagreements regarding the study quality were resolved through consensus between authors.

2.6 | Data extraction

For the studies that met inclusion criteria, relevant and specific information was extracted into Table 2. The extracted information included sample characteristics (average BMI or BMI status, sample size, average age, gender distribution, and population type), where the

study was completed, the domains of health literacy assessed, and measure characteristics (number of items, time taken to complete, whether the measure was validated). The relevant outcomes of the studies were presented in Table 2.

2.7 | Data synthesis and analysis

A qualitative analysis and synthesis were completed on the how each of the validated measures used in each study mapped onto the broad health literacy domains (psychological, nutritional, and physical activity) for individuals living with obesity and DEB. The psychometric properties of the measures used are presented in Table 1. Demographic and study properties were also presented in the table. A meta-analysis was not feasible for this study as this review primarily examined how health literacy is measured rather than the evaluating outcomes of health literacy interventions.

3 | RESULTS

3.1 | Quality assessment

The final articles were assessed using the quality assessment tool developed by NHLBI,⁴⁹ which aims to assess the internal validity of

TABLE 1 Search strategy.

Eating behavior	Health literacy	Obesity
"Binging" OR	"Health Literacy" OR	"BMI > 30" OR
"BED" OR	"Health Literacy Intervention" OR	"Morbid Obesity" OR
"Binge" OR	"Health Literacy Measure" OR	"Larger Body" OR
"Binge Eating" OR	"Nutrition Education" OR	"Obese" OR
"Bulimia Nervosa" OR	"Dietetic Education" OR	"Bariatric Surgery" OR
"Purging" OR	"Psychology Education" OR	"Obesity" OR
"Restriction" OR	"Health Education"	"High BMI"
"Grazing" OR		
"Night Eating" OR		
"Loss of Control" OR		
"Emotional Eating" OR		
"Stress Eating" OR		
"Disordered Eating" OR		
"Eating Behaviors"		

Note: Search method included eating behavior search terms AND health literacy search terms AND obesity search terms.

the included studies. Articles were rated by as either “good,” “fair,” or “poor.” Of the 12 studies, nine were rated as fair, three as good. The most common cause of bias was the limited test–retest data, short timeframe of the studies, and short follow-up time.

3.2 | Study characteristics

Of the 12 studies that met inclusion criteria, samples were predominantly female (65.9%) with an average age of 28 years old (range = 3 to 87). Six studies were conducted with children and adolescents, five with adults, and one with both children and adults. Most studies had a portion of their samples that met the BMI inclusion criteria of BMI ≥ 30 or stated the samples BMI status as “obese” or “obesity.” Samples were sought from a mix of treatment seeking individuals, a clinical sample, and community samples. The sample sizes varied from 97 to 1093 participants. Two studies were completed in the USA, two in China, one in France, one in India, one in Greece, one in Turkey, one in Saudi Arabia, one in Australia, one in New Zealand, and one in Iran, covering a wide range of socioeconomic statuses (SES). As per the inclusion criteria, all studies utilized validated measures to assess the identified health literacy domains.

3.3 | Nutritional domain of health literacy

Five studies assessed the nutritional domain of health literacy. These studies looked at varying aspects of the nutritional domain including feeding practices, food label literacy, and food choices. Rose et al.⁵⁰ specifically looked at knowledge of dietary recommendations, sources of nutrients, and knowledge of choosing everyday foods in adults suspected of having obstructive sleep apnoea. Example items from the Australian version of the General Nutrition Knowledge Questionnaire include “how many times a week do the Australian Dietary guidelines recommend that people eat fish?” and “from the list below which option would be the healthiest most balanced lunch?” Costarelli et al.⁵¹ assessed parents' understanding of nutritional information via the Greek Version of the Nutrition Literacy Scale through items such as “how easy is it to find out what to look for in a healthy diet?” They also looked at parental feeding practices through the Greek Version of the Comprehensive Parental Feeding Questionnaire (CPFQ) and how parents create healthy eating environments for children, control of children's food intake, and monitoring of unhealthy food intake through items such as “I encourage my child to eat a variety of foods.” Doustmohammadian et al.⁵² assessed varying domains of nutritional and food literacy in 10–12-year-olds including food choices, food label literacy, nutritional health knowledge, and food and nutritional information in students through items such as “if I have any questions about food and nutrition issues, I'm able to get information and advice from parents, teachers, etc.” They also assessed eating behaviors including the frequency of sweet and salty food, fast foods, energy versus non-energy drinks intake, and regularity of meals. Zhang et al.⁵³ used the Family Food Environments Questionnaire (FFEQ) to

assess school students' nutritional literacy relating to family meal practices (e.g., frequency of meals, family feeding patterns, role modeling, allowing kids to eat whatever/whenever, availability of foods, and carer nutritional literacy). An example item from the FFEQ is “I try to eat a balanced diet in front of my child.” They also looked at school student's frequency of consumption of different food groups (e.g., fast foods, soft drinks, dairy, grains, fruit and vegetables, and meats). Haszard et al.⁵⁴ assessed aspects of parental nutritional literacy, including healthy eating guidance and parental monitoring of unhealthy foods using the Child Feeding Practices Questionnaire (CFPQ) through items such as “how concerned are you about your child's weight?”

3.4 | Psychological domain of health literacy

There were six studies that measured the psychological domain of health literacy. These studies looked at varying aspects of the psychological domain of health literacy including eating behaviors, perceived stress, stress and coping, and appraisal of events. Jiang et al.⁵⁵ comprehensively assessed the psychological domain of health literacy by developing the Chinese Preschoolers Eating Behavior Questionnaire (CPEBQ), which required caregivers to assess preschoolers eating behaviors including emotional eating, food fussiness, eating habits, and social aspects of eating. Example items from the CPEBQ include “my child eats more when angry”, “my child enjoys all kind of food”, and “my child can eat by him/herself.” Debussche et al.⁵⁶ used the HLQ to assess adults' understanding and interpretation of health-related information, social support, processing of information, and decision-making. Example items from the HLQ include “I feel I have good information about health ...”, and “If I need help, I have plenty of people ...” Costarelli et al.⁵¹ used both the European Health Literacy Questionnaire (EU-HLQ) to assess parents' understanding, interpretation, and implementation of knowledge relating to health and the Greek version of the CPFQ to evaluate parental food control, restrictive practices, and parental pressures. Example items from the EU-HLQ and CPFQ include “how easy would you say it is to understand what your doctor says to you?” and “I encourage my child to eat a variety of foods”, respectively. Al-Ruthia et al.⁵⁷ briefly assessed the psychological domain of health literacy using the Single Item Literacy Screener to assess if young women could understand health-related instructions, by asking “how confident are you at filling out medical forms by yourself?” Knol and Brantley⁵⁸ measured levels of young people's perceived stress, emotion and stress-related eating behaviors, and coping. Example items from these questionnaires include “in the past month how often have you felt nervous and stressed?”, “I eat when I am anxious”, and “I am able to meet my emotional needs”, respectively. Zhang et al.⁵³ used the FFEQ to investigate student and caregivers' food rules in the family environment through items such as “I limit my child to eating foods high in sugar, fat, and salt.” Haszard et al.⁵⁴ assessed parent pressure (i.e., using food to control behavior), restrictive eating practices, and child control (i.e., decision-making) using the CFPQ. Example items include “I offer sweets to my child as

a reward for good behaviour” and “I encourage my child to eat less so he/she won't get fat.”

3.5 | Physical activity domain of health literacy

No studies exclusively utilized measures that assessed the physical activity domain of health literacy; however, there were items within some scales that assessed physical activity. For example, Zickgraf et al.,⁵⁹ Ramanathan et al.,⁶⁰ and Evgin and Kilic⁶¹ utilized measures that asked questions relating to physical activity such as “I exercise at least 3 days/week for 30 minutes”, “do you think physical inactivity in children can lead to obesity?”, and “it is important to do some kind of exercise for at least 60 minutes every day to be healthy”, respectively.

3.6 | Combined domains of health literacy

Three studies assessed the three key theoretical domains of health literacy relating to obesity. Ramanathan et al.⁶⁰ assessed knowledge, attitudes, and practices of mothers to children with obesity. The nutritional domain of health literacy was investigated by assessing parental understanding of the links between consumption of fruit and vegetables, eating other unhealthy foods (e.g., junk food), and childhood obesity. The physical activity domain was assessed by investigating parent's knowledge in relation to childhood obesity (e.g., “do you think physical inactivity leads to childhood obesity?”). The psychological domain was assessed by investigating parent awareness/knowledge and how it relates to childhood obesity (e.g., “obese children should be brought to seek doctors' advice”). Zickgraf et al.⁵⁹ used the Weight Management Skills Questionnaire to assess adults' frequency of food consumption, regularity of meals, portion control, hunger/fullness awareness, physical activity frequency, and mindful eating (e.g., “I avoid drinking during meals”). Subsections of the Weight and Lifestyle Inventory (WALI) were also used to assess psychological aspects of health literacy, including emotional overeating and eating in response to food-related cues (e.g., “during a typical week how many meals do you eat at a fast-food restaurant?”). The Questionnaire on Weight and Eating Patterns (QWEP) was utilized to measure BED-related symptoms, another psychological domain of health literacy (e.g., “During the past three months, did you ever eat, in a short period of time—for example, a two-hour period—what most people would think was an unusually large amount of food?”). Evgin and Kilic⁶¹ used several measures to assess adolescents' health literacy. Specifically, they examined the psychological domain, including stress and coping, obesity awareness, and emotional eating. Example items include “poor eating behaviours such as eating junk food every-day has a major role in causing obesity.” In addition, they evaluated the physical activity domain using the Obesity Awareness Scale (e.g., “burning calories during exercise is essential in maintaining a healthy body weight”), while nutritional literacy was captured using both the Obesity Awareness Scale and Healthy Life Awareness Scale (e.g., “drinking 8 glasses of water a day is important to be healthy”).

3.7 | Psychometric properties of measures

Across all studies extracted for the review, a total of 23 measures were used to assess aspects of the psychological, nutritional, and physical activity domains of health literacy. Questionnaires included a broad range of item numbers varying from one item in the Single Item Literacy Screener⁶² to 93 items in the General Nutritional Knowledge Questionnaire.⁶³ Where reported, the time to complete questionnaires ranged from 10 to 20 min. Most studies reported moderate to strong reliability and validity. Data relating to the specific psychometric properties of these measures are included in Table 2.

4 | DISCUSSION

This scoping review found a general dearth of measures that assessed health literacy on obesity and disordered eating. Existing measures that have been useful for the prevention and/or treatment of obesity and disordered eating include scales such as the Weight Management Scale, Obesity Awareness Scale, Emotional Eating Scale, and Eating Behaviours Questionnaires.^{55,59,61} However, it should be noted that these are not comprehensive measures of health literacy; instead, they independently assess psychological factors relating to obesity. Further, significant limitations in previous research were identified, including limited examination of risk and maintenance factors that underpin health literacy and health outcomes relating to obesity-specific conditions. Throughout the review, 23 different measures were used to evaluate components of health literacy among individuals living with obesity; only three studies used measures that had items that mapped onto all three broad domains of health literacy^{59,60,61} being psychological, nutritional, and physical activity. While the measures included in those three studies were found to assess key constructs relating to obesity and health literacy, such as weight management skills and parental knowledge and attitudes of childhood obesity,^{59–61} we found that there was no specific measure of health literacy for obesity that captured the multifaceted and complex nature of obesity and its comorbid concerns including DEB. Some of the limitations of these three studies included no reported data about the test-retest reliability of the measures used⁵⁹ and limited generalizability of the results; for example, adolescents and geographically specific samples.^{59,60} These findings from our review support Choudhry et al.'s⁶⁴ findings that further measures that comprehensively assess health literacy and health outcomes need to be developed and that there are few studies that examine and assess the underpinnings of health literacy and health outcomes. Future research conducted by the authors will aim to address these gaps in the literature.

Further, this was the first study to investigate the extent to which existing health literacy measures assess the three conceptual maintaining and modifiable domains of health literacy relating to obesity (psychological knowledge, nutritional knowledge, and knowledge about physical activity). As previously mentioned, only three studies in this review utilized multiple measures to achieve this.^{59–61} Developing a measure that encompasses all three modifiable and maintaining

TABLE 2 Data extraction table.

Authors	Title	Publication date	Country	Sample size	Sample type	Average age	BMI/BMI status	Gender %	Health literacy domain	Psychometric properties of measures
Debussche et al.	Characteristics of health literacy strengths and weaknesses among people at metabolic and cardiovascular risk: Validity testing of the Health Literacy Questionnaire	2018	France	175	Community—Adult	66	Obesity	Female 76.6%	Psychological	HLQ: <ul style="list-style-type: none"> • 44 Items • Strong reliability and validity • Cross Culturally Validated. • 10–15 min to complete
Jiang et al.	Development and preliminary validation of Chinese Preschoolers Eating Behavior Questionnaire	2014	China	Sample 1 = 313 Sample 2 = 603	Community—Preschool	Sample 1 = 4.3 Sample 2 = 4.6 Total = 4.45	Sample 1 = 12.5% Obesity Sample 2 = 10.9% Obesity	Sample 1 = Male 51.4%. Sample 2 = 53% Male	Psychological	CPEBQ: <ul style="list-style-type: none"> • 38 Items • Good reliability • Good content and construct validity
Zickgraf et al.	Development of Weight Management Skills Questionnaire in a pre-bariatric Sample	2020	USA	422	Preoperative Bariatric Sample	43.91	BMI > 35	Female 75%	Psychological Nutrition Physical Activity	Weight Management Skills Questionnaire: <ul style="list-style-type: none"> • 26 items. • Strong reliability • Strong validity WALL (Section H): <ul style="list-style-type: none"> • 10 items QWEP: <ul style="list-style-type: none"> • 17 items
Ramanathan et al.	Knowledge, Attitudes and Practice among mothers towards childhood obesity: A cross-sectional study	2022	India	220	Community—Parents	Child age = 9.56	13.8% of sample had obesity	Female 26.5%	Psychological Nutrition Physical Activity	Knowledge, Attitudes, and Practice: <ul style="list-style-type: none"> • 12 items • Strong face and content validity

(Continues)

TABLE 2 (Continued)

Authors	Title	Publication date	Country	Sample size	Sample type	Average age	BMI/BMI status	Gender %	Health literacy domain	Psychometric properties of measures
Costarelli et al.	Parental health literacy and nutritional literacy in relation to feeding practices	2020	Greece	402	Community—Parents	41	15.7% of sample had obesity	Female 68.4%	Psychological. Nutrition	<p>EU-HLQ:</p> <ul style="list-style-type: none"> • 47 items • Strong reliability <p>Nutrition Literacy Scale – Greek:</p> <ul style="list-style-type: none"> • 29 Items • Strong reliability <p>Greek version of CPFQ:</p> <ul style="list-style-type: none"> • 42 items • Strong reliability <p>Approximately 20 min to complete questionnaires</p>
Evgin and Kilic	Relationship between healthy life awareness, emotional eating, obesity awareness, and coping stress in adolescents.	2022	Turkey	382	Community—School Students	N/A	2.3% of sample had obesity	Female 75.1%	Psychological Nutrition Physical Activity	<p>Health Life Awareness Scale:</p> <ul style="list-style-type: none"> • 15 items • Strong reliability <p>Obesity Awareness Scale,</p> <ul style="list-style-type: none"> • 23 items • Strong reliability • Cross culturally validated. <p>Emotional Eating Scale for Children and Adolescents:</p> <ul style="list-style-type: none"> • 25 items • Strong reliability

(Continues)

TABLE 2 (Continued)

Authors	Title	Publication date	Country	Sample size	Sample type	Average age	BMI/BMI status	Gender %	Health literacy domain	Psychometric properties of measures
Al-Ruthia et al.	Relationship between health literacy and body mass index among Arab women with polycystic ovary syndrome	2017	Saudi Arabia	127	Clinical Sample—PCOS	27.4	Average BMI of 30.57	Female 100%	Psychological	<ul style="list-style-type: none"> • Cross culturally validated. • <i>Styles of Coping with Stress Inventory</i>: 30 items • Good reliability
Rose et al.	Relationship between nutritional knowledge, obesity, and sleep disorder severity	2016	Australia	97	Clinical Sample—sleep disorders	49.9	Mean BMI = 34.6	Female 59%	Nutrition	<ul style="list-style-type: none"> • General Nutrition Knowledge Questionnaire: 93 items
Doustmohammadian et al.	The Association and mediation role of Food and Nutritional Literacy (FNLIT) with eating behaviors, academic achievement, and overweight 10–12-year-olds: Structural equation modeling.	2022	Iran	803	Community—School	11.28	23.9% of sample had obesity	Male 52.9%	Nutrition	<ul style="list-style-type: none"> • <i>Food and Nutrition Literacy Questionnaire</i>: 46 items • <i>Eating Behavior Questionnaire</i>: 13 items • USDA Household Food Security Survey Module: 18 items • Cross culturally validated

(Continues)

TABLE 2 (Continued)

Authors	Title	Publication date	Country	Sample size	Sample type	Average age	BMI/BMI status	Gender %	Health literacy domain	Psychometric properties of measures
Knol and Brantley	Weight status and emotion and stress-related eating: Testing constructs of the transactional model of stress and coping	2021	USA	1070	Community—University student	20.9	12.3% of sample had obesity	Female 78.3%	Psychological	<i>Eating and Appraisal Due to Emotional and Stress:</i> <ul style="list-style-type: none"> • 49 items • Good validity and reliability <i>Perceived Stress Scale:</i> <ul style="list-style-type: none"> • 10 items • Strong reliability
Haszard et al.	Factor analysis of the Comprehensive Feeding Practices Questionnaire in a large sample of Children	2013	New Zealand	1093	Community	6.5	9.7% child sample had obesity 24.7% of mothers had obesity	Female 50.6%	Psychological Nutrition	CFPQ: <ul style="list-style-type: none"> • 49 items • Good validity
Zhang et al.	Family food environments and their association with primary and secondary students food consumption in Beijing, China: A cross-sectional study	2022	China	9686	Community—Primary and Secondary Students	N/A	17.4% of sample had pre-obesity, 23.4% of sample had obesity.	Female 49.5%	Psychological Nutrition	FFEQ for Chinese School children: <ul style="list-style-type: none"> • 49 items • Strong reliability <i>Food Consumption:</i> <ul style="list-style-type: none"> • 13 items

Abbreviations: CPEBQ, Chinese Preschoolers Eating Behavior Questionnaire; CFPQ, Child Feeding Practices Questionnaire; CPFQ, Comprehensive Parental Feeding Questionnaire; EU-HLQ, European Health Literacy Questionnaire; FFEQ, Family Food Environments Questionnaire; HLQ, Health Literacy Questionnaire; QWEP, Questionnaire on Weight and Eating Patterns; WALL, Weight and Lifestyle Inventory.

domains of health literacy relating to obesity would provide more holistic and succinct results and reduce participant fatigue, compared to delivering multiple questionnaires, which separately assessed these key domains (psychological knowledge, nutritional knowledge, and knowledge about physical activity). The findings from this review, again, highlight the need for the development and validation of a specific measure of health literacy of obesity.

Additionally, only six of the measures reviewed mapped onto either the psychological or nutritional domain of health literacy,⁵⁰⁻⁵⁸ and there were no measures included in the review that solely assessed the physical activity domain of health literacy relating to obesity. The other measures utilized across these studies assessed constructs such as general health literacy, eating behaviors, general lifestyle, nutritional literacy, emotional eating, perceived stress, coping skills, and family food environment.^{50-56,58} However, there were no measures that solely assessed health literacy relating to obesity and its three key domains, including nutritional knowledge, psychological knowledge, and knowledge about physical activity. The findings from this review support Choudhry et al.'s⁶⁴ finding that few measures thoroughly assess health literacy outcomes and that there are few studies that investigating the underpinnings of health literacy and health outcomes.

In summary, our review found that there is a lack of validated health literacy measures that adequately assess the key identified domains of health literacy of obesity: psychological knowledge, nutritional knowledge, and knowledge about physical activity. It is pertinent that both researchers and health professionals have insight into the health literacy of individuals who experience obesity, so that these gaps can be addressed in both clinical and policy/health promotion settings. To enable this, this review highlights the need for a robust validated health literacy measure that is specific to obesity and its key modifiable and maintaining domains, psychological knowledge, nutritional knowledge, and knowledge about physical activity. Utilizing a multicomponent health literacy measure could benefit clinicians at different stages of obesity intervention, including prevention and treatment, by identifying the gaps in knowledge that could be directly addressed in treatment. In addition, a multicomponent health literacy measure could assist with identifying the complex and multifaceted risk factors and associated health complications of obesity.

4.1 | Strengths and limitations

One limitation of the reviewed studies was the lack of diversity in the samples, with the majority of the studies reviewed ($n = 10$) including samples that were predominately female. This limits our capacity to deduce information about male knowledge of obesity and DEB and whether these measures accurately assess these key domains in male populations. Another common limitation from the studies reviewed was the limited data reported on other psychometric properties of the measures used, including the test-retest reliability, other validity statistics such as convergent and discriminate validity, the time taken to complete measures, and whether measures were cross culturally validated, or if that were validated across population groups (i.e., clinical

vs. general population). An overall limitation of the current review was that most of the studies mapped onto the psychological and nutritional domains of health literacy, and we did not have any studies that solely mapped onto the physical activity domain. Consequently, we were not able to assess the physical activity-related health literacy domain. In addition, the use of five authors to screen the 3150 articles may have inflated the inter-rater variability of the articles screened. Another limitation of this review was the adherence to a singular definition of obesity as a BMI ≥ 30 when selecting eligible studies. As the definition of obesity may vary across ages and countries, particularly different cultural groups, the adherence to a definition of obesity as a BMI ≥ 30 limited our search strategy and reduced the generalizability of our findings.

Overall strengths from the review include the use of strict inclusion criteria such as only including studies that utilized validated measures. This enhanced the quality of the results. Similarly, inclusion criteria of all ages was a strength of the review, as it provided insight into knowledge about the three health literacy domains across the lifespan. Finally, our review included studies across the world and from diverse populations.

4.2 | Future directions

Future research would benefit from having a comprehensive and validated measure of health literacy of obesity that encompassed the three-hallmark maintaining and modifiable domains of health literacy, that of nutritional literacy, psychological literacy, and literacy about physical activity. Further to this, future innovative health literacy measures should aim to comprehensively present the psychometric properties of the instrument to ensure replicability and robustness of the measure. As highlighted above, future research should endeavor to include more gender diverse samples to ensure knowledge relating to obesity, and DEB is assessed across genders. Moreover, future research should ensure inter-rater variability is not inflated in the screening process by only using two to three authors to screen articles for the review. Another consideration in the development of a health literacy measure of obesity is to ensure it is validated in different cultures and countries to adequately represent cultural differences, especially when different BMI thresholds are used to identify those with obesity and/or those at risk of obesity-related complications. Similarly, it is important to acknowledge the link between SES, weight, and health literacy when examining this area in future studies. Previous research in low SES populations has found that health literacy is often lower and weight is typically higher, highlighting a need for targeted health literacy interventions on obesity specifically in lower SES populations.^{52,53,56,60}

5 | CONCLUSION

To adequately treat and prevent obesity, targeting health literacy is essential. It is important to assess knowledge about obesity and

disordered eating to subsequently guide clinical practice (e.g., providing effective and targeted treatments), education programs, health policies, and public health initiatives (e.g., health star ratings on food labels). By targeting and improving the health literacy of the Australian population, there may be a reduction in the prevalence and impacts of obesity at an individual and population level. This review has highlighted that there are currently no validated measures that exist that specifically and comprehensively measure the health literacy of obesity and DEB. These findings have underscored a significant gap in the research relating to obesity, disordered eating, and health literacy which would benefit from being addressed.

AUTHOR CONTRIBUTIONS

Ashleigh Upton: Conceptualization; formal analysis; writing of original draft; review; and editing. **Jayanthi Raman:** Conceptualization; supervision; and review. **Dean Spirou:** Conceptualization; screening of articles; supervision; and review. **Phillipa Hay:** Conceptualization; supervision; and review. **Matthew Craig:** Database searches and screening of articles. **Natalie Saul:** Database searches and screening of articles. **Olivia Winmill:** Database searches and screening of articles.

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CONFLICT OF INTEREST STATEMENT

The authors have declared no competing interests exist.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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