FOOD AND NUTRITION
IN COLLECTIVE HEALTH
DOI: 10.12957/demetra.2023.65401

DEMETRA
Alimentação, Nutrição & Saúde

Thanise Sabrina Souza Santos[1]
Maria Cecília Ramos de Carvalho[1]
Camila Kümmel Duarte[1]
Patrícia Constante Jaime[2]
Aline Cristine Souza Lopes[1]

[1] Universidade Federal de Minas Gerais, Departamento de Nutrição, Grupo de Pesquisa de Intervenções em Nutrição. Belo Horizonte, MG, Brasil.

[2] Universidade de São Paulo, Faculdade de Saúde Pública, Departamento de Nutrição. São Paulo, SP, Brasil.

Financial support: Ministério da Saúde (TED: 698365).

Correspondence
Aline Cristine Souza Lopes
alinelopesenf@gmail.com

Measuring the balance of decisions to reduce body weight among overweight or obesity people: a systematic review

Medida do equilíbrio de decisões para redução do peso corporal entre pessoas com sobrepeso ou obesidade: uma revisão sistemática

Abstract

Introduction: Behavioral strategies have been adding to the effectiveness of obesity treatment. And the assessment of the decisional balance (DB) for weight reduction, that is, the balance between expected losses and gains around the behavioral changes, is strategic for managing obesity. The DB assessment may contribute to the agreement on strategies to face the challenges of the treatment. But, there is a need to use a valid instrument to assess the DB. ***Objective:*** evaluate the quality of instruments assessing DB for weight reduction to qualify obesity management in the Sistema Único de Saúde – SUS (Unified Health System). ***Methods:*** A systematic review of studies about instrument development and/or validation was carried out on seven databases using the Cosmin methodology. Terms related to psychometrics, obesity, and DB were combined with Boolean operators to guide the search. Two researchers performed independently and in duplicate: data extraction, quality assessment, and evidence synthesis, and divergences were resolved by consensus. This review was registered in the international database Prospero (CRD42020197797). ***Results:*** Five studies were identified. Three of them reported translations and cross-cultural validity of the same instrument. All analyses presented DB in two dimensions (pros and cons), but used doubtful or inadequate methods. Most of the evidence was very low rate. ***Conclusions:*** The results did not support the instrument's use, translations, or cross-cultural adaptation. It is necessary to develop a new tool. By providing a valid instrument for use in SUS, this study could contribute to qualifying the care of people with obesity and stopping the growth of obesity in the country.

Keywords: Decision making. Transtheoretical model. Obesity management. Unified health system. Validation study.

Resumo

Introdução: Abordagens comportamentais têm contribuído para a efetividade do tratamento da obesidade. A avaliação do equilíbrio de decisões (ED) para redução de peso, isto é, o equilíbrio entre prós e contras da mudança de comportamento, é estratégica no tratamento, contribuindo para a pactuação de estratégias para o enfrentamento dos desafios. É necessário, porém, utilizar instrumentos válidos para mensurar o ED. ***Objetivo:*** Avaliar a qualidade de instrumentos de avaliação do ED para redução do peso corporal visando qualificar o cuidado da pessoa com obesidade no Sistema Único de Saúde (SUS). ***Métodos:*** Realizou-se revisão sistemática da literatura sobre o desenvolvimento e a validação de instrumentos em sete bases de dados seguindo a metodologia Cosmin. Variações dos termos psicometria, obesidade e ED foram combinadas com operadores booleanos. Em duplicada e independentemente, duas pesquisadoras realizaram: extração

de dados, avaliação da qualidade e síntese de evidências, sendo as divergências solucionadas por consenso. Esta revisão foi registrada na base internacional Prospero (CRD42020197797). ***Resultados***: Identificaram-se cinco estudos, sendo que três realizaram a tradução e adaptação transcultural do mesmo instrumento. Todos os estudos apresentaram ED em duas dimensões (prós e contras), mas usaram métodos duvidosos ou inadequados, e a maioria apresentou evidências científicas de muito baixa qualidade. ***Conclusões***: Os resultados não sustentaram o uso dos instrumentos existentes nem sua tradução e adaptação transcultural, sendo necessário o desenvolvimento de um novo instrumento. Este estudo, ao disponibilizar um instrumento válido para uso no SUS, poderá contribuir para qualificar o cuidado da pessoa com obesidade e deter o crescimento da obesidade no país.

Palavras-chave: Tomada de decisões. Modelo transteórico. Manejo da obesidade. Sistema Único de Saúde. Estudos de validação.

INTRODUCTION

Obesity is a public health issue in the world[1] and is positively associated with mortality rates[2] and economic burden[3], damaging individuals' and populations' physical and mental health.[2,4] Between 2006 and 2019, the prevalence of obesity increased by 3.8% per year.[5] It points to the urgency of developing actions by authors of policies and programs that could support health professionals in the care of individuals with obesity. A projection suggests that the population will not achieve the Brazilian goal to stop obesity from increasing among adults by 2025 if the time tendency is maintained. This scenario requires advances in the treatment of obesity.[6] Among the interventions aimed at weight reduction, behavioral strategies have been highlighted for contributing to greater effectiveness of the treatment, suggesting its strategic potential for weight loss.[7]

Among the theories that have guided the behavioral approaches to weight reduction, the Transtheoretical Model (TTM) stands out.[8-12] This model proposes to explain the structure of behavior change around four pillars: stages of change, processes of change, decisional balance, and self-efficacy. The stages of change (Pre-contemplation, Contemplation, Preparation, Action, and Maintenance) identify the individual's readiness to change a given behavior. The processes of change indicate the thoughts and attitudes that enable the individual to evolve between the stages of change. The decisional balance measures the individuals' importance to behavioral change's potential pros and cons. And self-efficacy indicates the individual's confidence to change his behavior and maintain this change.[8-10]

In Brazil, the Ministry of Health includes the TTM among the strategies for obesity management in the Sistema Único de Saúde – SUS (Unified Health System) to qualify the comprehensive and humanized care.[13-15] Although the TTM has shown promising evidence for weight reduction,[11,12,16] TTM-based interventions are still focused on stages of change, bounding the understanding and applicability of the model, mainly in individuals in stages of change that precede action.

In this sense, it was decided, as the focus of this study, to investigate the construct of the decisional balance. Specifically for weight reduction, the construct represents the balance between the pros and cons the individual identifies when he reflects on the behavioral changes aimed at weight reduction. In other words, individuals who attach greater importance to the pros than to the cons have a positive decisional balance. It contributes to behavior change and progression for more advanced stages of change. On the other hand, those who identify more cons than pros for weight reduction have a negative decisional balance and require specific interventions; that is, interventions that favor overcoming barriers and identification of the benefits, increase motivation, and stimulate the decision-making for behavioral change.[17,18]

By contributing to identifying the pros and cons of change of behavior, the assessment of the decisional balance guides the choice of more suitable intervention strategies more adequate to the needs of individuals and groups. It is especially beneficial when an individual finds resistance to reducing weight or even when he reaches a body weight plateau. For example, given the identification of the time required to prepare adequate and healthy meals as an obstacle to the weight reduction process, the health team can select the best strategies to reduce the necessary time together with the individual. On the other hand, identifying and reinforcing the gains in sleep quality and mental health can stimulate new behavioral changes.[18,19] The knowledge of the pros and cons of weight reduction for the individual can be helpful to guide the choice of strategies that incorporate their experiences with the weight reduction process, supporting the confrontation of challenges in managing obesity in SUS.

However, when proposing protocols for obesity treatment in SUS based on the TTM, it is necessary to use proper and applicable instruments for the target audience. This question, along with the importance of the construct of the decisional balance for obesity management, guided this study of systematic literature search for a validated instrument to assess the decisional balance for weight reduction. The results of this search may support the implementation of comprehensive care based on scientific evidence in SUS. Thus, this study aimed to evaluate the quality of instruments for assessing the decisional balance to weight reduction, aiming to qualify the treatment of obesity in SUS.

METHODS

A systematic review of observational and intervention studies that describe the development and/or validation of instruments assessing decisional balance for weight reduction was carried out. This review was carried out and reported according to the Cosmin (COnsensus-based Standards for the selection of health Measurement INstruments) methodology for systematically studying instruments of patient-reported measures.[20-22] This review was registered in the International Prospective Register of Systematic Reviews (Prospero) (CRD42020197797).

Search strategies

The searches were performed in July 2020 in the following databases: Embase, Medline (Pubmed), PsycINFO, Cinahl, Scopus, Web of Science, and Scielo. Additionally, it was carried out a hand-searching of reference lists of the select studies to read the full-text, preprint databases (Research Square), and gray literature (Google Scholar). Year, local, and language of publication were not restricted to make it possible to identify all instruments assessing decisional balance for weight reduction.

The search strategy consisted of three English term groups: *psychometrics*, *obesity/overweight*, and *decisional balance*, combined with the Boolean operator 'AND.' The MeSH terms, Emtree terms, and DeCS were used in Pubmed, Embase, and Scielo, respectively. Text terms had been adapted from indexing terms for the other databases. Synonyms were added to MeSH terms on the search strategies using the Boolean operator 'OR.' The search strategies are displayed in the supplemental material (Supplemental Table S1), and the most important used terms are following described: '*psychometrics*'; '*obesity*'; '*obesity management*'; '*overweight*'; '*weight loss*'; '*decision making*'; '*decision theory*'; '*biobehavioral sciences*'; '*models, theoretical*'; '*behavior and behavior mechanisms*'; '*feeding behavior*'; and '*motivation*'.

Eligibility criteria

Observational and intervention studies describing the development and validation of instruments to assess decisional balance for weight reduction were included in this systematic review. Studies in which decisional balance for weight reduction were assessed without reporting its development and validation were excluded, but their reference lists were also checked for eligible studies.

Study selection and data extraction process

A study selection was performed in the software EndNote X9 in August 2020. Two investigators (TSSS and MCRC), with expertise in the TTM and systematic review methods, independently screened the titles and abstracts of studies identified in the initial searches to check eligibility criteria. The same two investigators read the full-text versions of selected studies to determine their inclusion (or not) in this review. Divergences were resolved by consensus from the resumption of eligibility criteria.

Data extraction, quality assessment, and evidence synthesis were performed in sheets shared with the investigators. Data from the included studies were also extracted independently and replicated from TSSS and MCRC. These data consist of study characteristics (article title and reference, year and place of study, and sample characteristics) and a description of the instrument (target population, mode of administration, numbers of items and dimensions, response options, scoring, language(s), interpretability, and applicability). Divergences were also resolved by consensus following the guidelines of the Cosmin methodology for extracting these data.

Quality assessment and evidence

Between September and October 2020, were evaluated the methodological quality of included studies, the development process of the instrument, and nine measurement properties (content validity, structural validity, internal consistency, cross-cultural validity/ measurement invariance, reliability, measurement error, criterion validity, hypothesis testing, and responsiveness) using the Cosmin methodology. Content validity is assessed into relevance, comprehensibility, and comprehensiveness.[20-22]

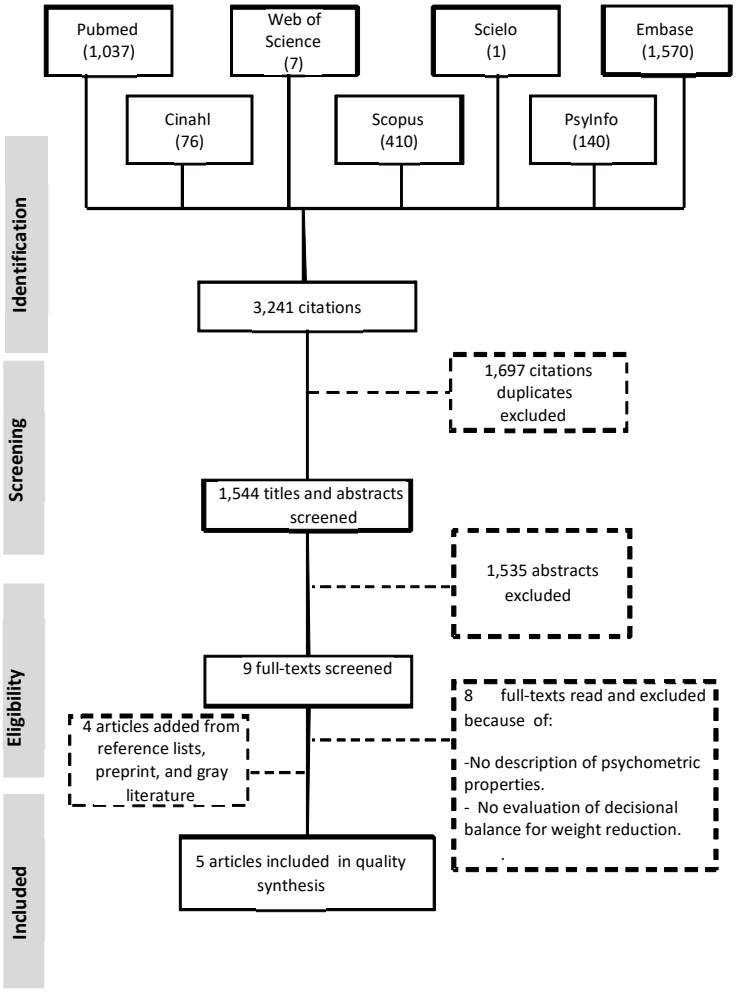
Studies reporting the development and/or measurement properties were rated using the following 4-point rating scale: “very good”, “adequate”, “doubtful”, and “inadequate”[20-22] by two investigators (TSSS and MCRC) independently and in duplicate. The evidence provided in these studies was also evaluated as “sufficient”, “insufficient”, “indeterminate”, or “inconsistent”. The quality of the evidence was examined using an adapted version of the Grade (Grading of Recommendations Assessment, Development, and Evaluation) approach, as recommended in the Cosmin methodology. Quality of evidence was rated as “high”, “moderate”, “low”, or “very low”, depending on the risk of bias, inconsistency, imprecision, and/or indirectness. Any divergences in quality assessment and evidence synthesis were resolved by consensus consulting the criteria for an evaluation in Cosmin methodology.[20-22] All doubts regarding using Cosmin methodology criteria were clarified with the instrument's authors.

Based on the evaluation of the measurement properties and the quality of evidence, the instruments were rated as “A”, “B”, or “C” according to the recommendation for or against the use. Instruments rated as “A” are recommended for application because they have “sufficient” content validity, and the quality of the evidence for internal consistency is classified at least as “low”. Instruments rated as “B” do not meet the criteria to be rated as “A” or “C” and have some potential for use. Finally, instruments rated as “C” are not recommended for service because they have “high” quality of evidence for measurement properties rated as “insufficient”.[21]

RESULTS

Of 1,544 citations found on the databases, one study[23] was included in this systematic review. In addition, four other studies were included: two[24,25] were retrieved from the reference list of the first study,[23] and the other two[26,27] were found on the grey literature search (Figure 1).

Figure 1. Flowchart of the systematic review of instruments assessing decisional balance for weight reduction among individuals with overweight or obesity.



The characteristics of included studies are found in Table 1. Analyses were carried out in five countries (United States,[24] Japan,[25] Taiwan,[23] Italy,[26] and New Zealand[27]) and published between 1988[24] and 2015.[26] Sample sizes ranged from 62[26] e 988[25] individuals, including from teenagers (high school students)[23] to seniors (up to 70 years old)[27]. Most studies included people from both sexes and reported response rates higher than 50%.[23,24,26,27] The mean corporal weight of participants was reported in only one study[25], and other two studies reported the nutritional status.[23,26]

Table 1. Characteristics of the studies included in the systematic review and respective samples. Brazil, 2020.

Reference	Title	Year	Location	Sample size	Mean age (SD[a]) (years)	Sex (%)	Mean weight (SD[a]) (kilos)	Mean BMI[b] (SD[a]) (kg/m²) or nutritional status	Response rate (%)
O'Connell & Velicer (1988)[24]	A decisional balance measure and the stages of change model for weight loss	1985	United States	264	90% with age between 18 and 27 years	70% female; 30% male	Not reported	Not reported	88
Akamatsu, Otake, Shimai (2003)[25]	Development of Japanese Decision Balance Index (DBI) and stage of behavioral change	Not reported	Japan	988	18.7 (1.6)	100% female	50.3 (6)	19.9 (2.1)	Not reported
Yeh (2005)[23]	Applicability of the transtheoretical model in weight management in an adolescent population in Taiwan	2005	Taiwan	491	Participants were high school students, but age was not reported.	58.9% female; 41.1% male	Not reported	Normal weight: 66.4%. Overweight or obese: 33.6%.	100
Falchi et al. (2015)[26]	Validation of decisional balance inventory test in Italian: assessment of motivation in weight loss	Not reported	Italy	62	Cases (with obesity): 50 (11). Controls (with normal weight): 38 (9.6)	Cases: 70.2% female; 29.8% male. Controls: 93.3% female; 6.7% male.	Not reported	Cases: ≥30kg/m². Controls: from 18.5 to 25kg/m².	Cases: not reported. Controls: 100
Simmons & Mesui (1999)[27]	Decisional balance and stage of change in relation to weight loss, exercise and dietary fat reduction among Pacific Islands people	1993-1994	New Zealand	195	32 (13)	53% female; 47% male.	Not reported	Not reported	100

[a]SD = Standard deviation. [b]BMI = Body mass index.

The characteristics of the five evaluated instruments are described in Table 2. Three of them were developed for individuals who wish to manage their weight[23–25] and one for individuals undergoing preventive follow-up for diabetes,[27] regardless of the nutritional status. On the other hand, Falchi and collaborators proposed an instrument for individuals enrolling in obesity treatment.[26]

Three instruments[23,25,26] were translations of the original proposed by O'Connell & Velicer.[24] This original instrument[24] and the three translations[23,25,26] were composed of two dimensions ("pros" and "cons" of weight reduction) and had the same five response options. However, two[23,25] of the translations had fewer items per dimension when compared to the original;[24] and other translation[26] suggested a different score calculation. The included study that was not related to the instrument proposed by O'Connell & Velicer[24] also had two dimensions ("pros" and "cons" of weight reduction), but items were followed by "yes" and "no" response options[27] (Table 2).

Table 2. Characteristics, feasibility, and interpretability of the instruments included in the systematic review. Brazil, 2020.

Reference	Target population	Mode of administration	Total number of items	Number of dimensions	Number of items per dimension	Response options	Scoring	Original language	Is it an original instrument?	Are translations available?
O'Connell & Velicer (1988)[24]	Individuals who wish to manage their weight	Self-reported	20	2 (Cons and Pros)	10	From 'not important' (1) to 'extremely important' (5)	'Sum of the cons' and 'sum of the pros'	English	Original	Yes
Akamatsu, Otake, Shimai (2003)[25]	Individuals who wish to manage their weight	Self-reported	14	2 (Cons and Pros)	7	From 'not important' (1) to 'very important' (5)	'Sum of the cons' and 'sum of the pros'	English	Translation	No
Yeh (2005)[23]	Teenagers who wish to manage their weight	Self-reported	14	2 (Cons and Pros)	7	From 'not important' (1) to 'extremely important' (5)	'Sum of the cons' and 'sum of the pros'	English	Translation	No
Falchi et al. (2015)[26]	Individuals enrolling in clinical treatment of obesity	Self-reported	20	2 (Cons and Pros)	10	From 'not important' (1) to 'extremely important' (5)	Ratio between 'sum of the cons' and 'sum of the pros'	English	Translation	No
Simmons & Mesui (1999)[27]	Non-diabetic individuals enrolling in the program for primary prevention of diabetes	Not reported	12	2 (Cons and Pros)	5 Pros and 7 Cons	'yes' and 'no'	'Sum of the cons' and 'sum of the pros'	Tongan	Original	No

[a]SD: Standard Deviation.[b] Precontemplation, contemplation, action, and maintenance. [c]Precontemplation, contemplation, preparation, action, and maintenance.

Table 2. Characteristics, feasibility, and interpretability of the instruments included in the systematic review. Brazil, 2020.(Cont)

Reference	Feasibility				Interpretability			
	Patient's comprehensibility	Ease of administration	Completion time	Patient's required mental and physical ability level	Ease of score calculation	Scores of the study population (Mean (SD[a]))	Individuals with scores not calculated (%)	Scores available for relevant (sub)groups
O'Connell & Velicer (1988)[24]	Not assessed	Yes	40 minutes (not only decisional balance items)	Able to fill the form without help	Yes	Pros: 31.38 (10.74). Cons: 23.32 (7.93)	11.74	Scores according to 4 stages of change[b]
Akamatsu, Otake, Shimai (2003)[25]	Not assessed	Yes	15 to 20 minutes (not only decisional balance items)	Able to fill the form without help	Yes	Not reported	Not reported	Scores according to 5 stages of change[c]
Yeh (2005)[23]	The quality of the study was doubtful.	Yes	40 minutes (not only decisional balance items)	Able to fill the form without help	Yes	Pros: 18.57 (6.99). Cons: 15.88 (5.69)	Not reported	Scores according to sex, nutritional status and 5 stages of change[c]
Falchi et al. (2015)[26]	The quality of the study was inadequate.	Yes	In average, 10 minutes	Able to fill the form without help	Yes	Cases - pros: 30.7 (6.7); and cons: 22.1 (5.5). Controls - pros: 17.2 (5.6) and cons: 16.7 (4.7)	Not reported	Scores according to nutritional status
Simmons & Mesui (1999)[27]	Not assessed	Yes	Not reported	Not reported	Yes	Men - pros: 3.1 (1.8), cons: 3.1 (1.8). Women - pros: 4.1 (1.2), cons: 2.7 (1.9)	Not reported	Scores according to demographics and 5 stages of change[c]

[a]SD: Standard Deviation. [b]Precontemplation, contemplation, action, and maintenance. [c]Precontemplation, contemplation, preparation, action, and maintenance.

The scores were deemed interpretable considering their distributions in study populations and subgroups. The instruments were apparently feasible as they did not require particular ability from participants, and seemed to be easy to administer and score.

Quality assessment and evidence synthesis

The quality assessment and evidence synthesis are detailed in the supplemental material (Supplemental Table S1 to S4). The instrument's development was deemed inadequate for all five studies. No study reported the comprehensiveness of the tool with the target population. Simmons & Mesui included the target population in an evaluation of the relevance but with questionable quality.[27] Yeh[23] and Falchi et al.[26] reported how the target populations understood the instruments, but the methodological quality was doubtful[23] and inadequate,[26] respectively. O'Connell & Velicer[24] included experts in evaluating relevance and comprehensiveness but with questionable methodological quality.

Structural validity was deemed with inadequate methodological quality in four studies in which this property was assessed;[23–25,27] and Falchi et al. did not investigate the structural validity of the instrument.[26] Three studies applied Classical Test Theory using exploratory[24,25] or confirmatory[23] factor analysis; however, all of them used inadequate methods of extraction (principal components) and rotation (orthogonal) of factors.

No study investigated measurement error, criterion validity, or responsiveness. All studies reported information on internal structure and hypothesis testing. The study of the internal consistency obtained very good[23–25] or inadequate[26,27] methodological quality. The inadequacy is justified by calculating the parameters for the whole scale, not for each dimension. Ratings for hypothesis testing for construct validity ranged from doubtful when authors performed comparisons between subgroups,[23–27] to inadequate when scores were compared to measures of other instruments.[25]

Cross-cultural validity was deemed inadequate methodological quality for all three translations,[23,25,26] due to sample characteristics,[23,25] data analysis[25,26], and/or sample size.[26] Akamatsu, Otake, and Shimai[25] and Falchi et al.[26] assessed reliability with doubtful methodological quality, as evidence of systematic change was not provided, and it was unclear if test conditions were similar across replicates.

Assessment and grading of the evidence considered the methodological quality above, and the results are displayed in Table 3. No instrument yielded high-quality proof in any of the nine measurement properties assessed. Some measurement properties had sufficient evidence, but the quality of evidence was low or very low. The measurement properties set by O'Connell & Velicer[24] presented a quality of evidence ranging from high to very low, and in its translations,[23,25,26] the quality of evidence ranged from moderate to very low. Measurement properties assessed for the instrument proposed by Simmons & Mesui[27] had low to very low-quality evidence.

Table 3. Validity and quality of evidence of the instruments included in the systematic review. Brazil, 2020.

Reference	Content validity						Other measurement properties			
	Relevance		Comprehensiveness		Comprehensibility		Structural validity		Internal consistency	
	Evidence[a]	Quality of evidence[b]	Evidence[a]	Quality of evidence[b]	Evidence[a]	Quality of evidence[b]	Evidence[a]	Quality of evidence[b]	Evidence[a]	Quality of evidence[b]
O'Connell & Velicer (1988)[24]	±	Low	-	Moderate	-	Very low	-	Very low	?	High
Akamatsu, Otake, Shimai (2003)[25]	-	Very low	-	Very low	-	Very low	-	Very low	?	Low
Yeh (2005)[23]	-	Very low	-	Very low	-	Very low	+	Very low	?	Moderate
Falchi et al. (2015)[26]	±	Very low	-	Very low	-	Very low	Not assessed	Not applicable	?	Very low
Simmons & Mesui (1999)[27]	±	Low	-	Very low	-	Very low	?	Very low	?	Very low

[a]Evidence rating: +: Sufficient. -: Insufficient. ±: Inconsistent. ?: Indeterminate. [b]Quality of evidence: high, moderate, low or very low.

.

Table 3. Validity and quality of evidence of the instruments included in the systematic review. Brazil, 2020. (Continues)

Reference	Other measurement properties					
	Cross-cultural validity		Reliability		Hypotheses testing	
	Evidence[a]	Quality of evidence[b]	Evidence[a]	Quality of evidence[b]	Evidence[a]	Quality of evidence[b]
O'Connell & Velicer (1988)[24]	Not assessed	Not applicable	Not assessed	Not applicable	+	Low
Akamatsu, Otake, Shimai (2003)[25]	?	Very low	?	Very low	+	Very low
Yeh (2005)[23]	+	Very low	Not assessed	Not applicable	+	Very low
Falchi et al. (2015)[26]	?	Very low	+	Very low	+	Very low
Simmons & Mesui (1999)[27]	Not assessed	Not applicable	Not assessed	Not applicable	+	Very low

[a]Evidence rating: +: Sufficient. -: Insufficient. ±: Inconsistent. ?: Indeterminate. [b]Quality of evidence: high, moderate, low or very low.

Considering the quality assessment, the criteria for rating as "A" were not met by any instrument, as they had no sufficient evidence for content validity, and all of them had indeterminate internal consistency. The "C" rating criteria were also not met, as the proof of insufficient measurement properties was not considered high quality. Finally, al[23–27] instruments were rating as "B", showing some potential use.

DISCUSSION

Five studies that developed and/or validated instruments assessing decisional balance for weight reduction were identified. The analysis of these studies suggested the need for more tools that presented high-quality evidence and sufficient validity. There is no valid instrument to assess the decisional balance for weight reduction and support professionals in managing obesity in SUS.

Of the identified studies,[23-27] three of them[23,25,26] were translations of a North American instrument proposed by O'Connell & Velicer,[24] differing from the original[24] in the number of items and scoring. The translations provided tools assessing the decisional balance in Japanese,[25] Taiwanese,[23] and Italian.[26] The fifth instrument[27] was developed for Pacific Island populations. However, only two studies[26,27] included individuals undergoing obesity treatment.

Overall, the included studies did not present enough information to adequately assess their methods and the measuring properties, resulting in "doubtful" and "inadequate" classifications in most of the evaluated items.

The lack of information influenced the final assessments and introduced a risk of bias for the quality of evidence. As the methods used were insufficiently described in all studies,[23-27], carrying out an adequate methodological quality classification was not feasible. However, it is emphasized that, in a scientific paper, the authors should clearly explain how the data were collected, organized, and analyzed. The methodology section should have enough information to provide its replication for the other researchers.[28]

The negative results arising from this systematic review regarding the assessment of the measurement properties of the instruments may derive from the period in which the studies were developed, more than a decade ago, especially considering the recent advances in Psychometrics.[29] For example, three[23–25] out of the five studies used the principal components analysis, and none applied the Item Response Theory, which the knowledge about the structural validity and precision of measurements may influence.[30] Additionally, only one of the studies[23] assessed measurement invariance to corroborate the evidence for cross-cultural validity, generating uncertainty regarding the quality of the translations.

Internal consistency and hypothesis testing were the most frequently assessed properties. All studies evaluated the relationship between decisional balance scores and stages of change for weight reduction,[23-27] obtaining associations in the expected direction, although the evidence had very low quality.[17,31]

Even though the instruments included in this review were developed for use in other countries, they could be applied in Brazil if they reached the expected quality through the process of translation and cross-cultural adaptation; based on the available evidence, all instruments were rated as "B", which means they have some potential for use. However, the evidence for relevance and comprehensiveness had insufficient or inconsistent results ranging from moderate to very low quality. Furthermore, there are aspects of decisional balance for weight reduction that were not considered, such as self-esteem, social support, and financial and time costs.[32,33]

In conclusion, the existing instruments are inadequate to be translated and cross-adapted to Brazil, requiring the development of a new tool to assess the decisional balance for weight reduction, aiming at its use within the scope of SUS.

The results from this systematic review should be interpreted in light of its limitations. The absence of a specific indexing term, such as a MeSH term, to describe decisional balance resulted in a large pool of initial results unrelated to the construct. Only one study from the original search was included in the review[23]; the other four studies were retrieved from reference lists[24] or the gray literature.[25-27] Three out of these four studies were indexed in a different database[25-27] and one had no keywords.[24]

On the other hand, a highlight of this systematic review was the use of an unrestricted search strategy, enabling the identification of all available instruments regardless of year, place, or language of publication. This broad search aimed to contribute to the identification of tools that could be better applied in the routine of health services in the management of obesity. The use of a specific guideline for conducting the review also contributed to a complete description and a careful assessment of each instrument, as well as its development and validity, with the presentation of the respective quality of evidence and recommendation for use. Finally, contacting the authors of the Cosmin guideline to resolve doubts and correctly assess each instrument is also the strength of this review.

CONCLUSIONS

This systematic review gathered information about the quality of instruments available for assessing the decisional balance for body weight reduction, presenting the non-recommendation for use or translation and cross-cultural adaptation of the available tools to Brazil. Thus, it is necessary to develop and validate a new instrument for evaluating the decisional balance of weight reduction, given the indication by the Ministry of Health of the use of TTM for the management of obesity in SUS. However, this new instrument should follow the recommendations of the field of Psychometrics and include pros and cons perceived by SUS users for changing behaviors aimed at reducing body weight.

It should be noted that the availability of a valid instrument to assess the decisional balance for weight reduction could contribute to greater effectiveness of interventions based on the TTM, as well as qualify the management of obesity in SUS and favor the achievement or approximation of the goal to halt the rise of obesity.

Supplemental Table S1: Search strategies used for each database. Brazil, 2020.

Pubmed
((((("Psychometrics"[MeSH Terms] OR "Psychometrics"[All Fields]) OR "Validation Study"[Publication Type]) OR "Validation Study"[All Fields]) AND ((("Obesity"[MeSH Terms] OR "Obesity Management"[MeSH Terms]) OR "Overweight"[MeSH Terms]) OR "Weight Loss"[MeSH Terms])) AND ((((((((((((((((((((("Decision Making"[MeSH Terms] OR "Decision Making"[All Fields]) OR "Decision Theory"[MeSH Terms]) OR "Decision Theory"[All Fields]) OR "Biobehavioral Sciences"[MeSH Terms]) OR "Biobehavioral Sciences"[All Fields]) OR "models, theoretical"[MeSH Terms]) OR "models theoretical"[All Fields]) OR "Behavior and Behavior Mechanisms"[MeSH Terms]) OR "Behavior and Behavior Mechanisms"[All Fields]) OR "Feeding Behavior"[MeSH Terms]) OR "Feeding Behavior"[All Fields]) OR "Decisional balance"[All Fields]) OR "Decisional balance sheet"[All Fields]) OR "Decision balance"[All Fields]) OR ((((("balance"[All Fields] OR "balanced"[All Fields]) OR "balances"[All Fields]) OR "balancing"[All Fields]) AND ((((("decision"[All Fields] OR "decisions"[All Fields]) OR "decisive"[All Fields]) OR "decisively"[All Fields])))) OR "Pros and cons"[All Fields]) OR "Pros and cons"[All Fields]) OR "Benefits and barriers"[All Fields]) OR "Perceived benefits and barriers"[All Fields]) OR "Facilitators and barriers"[All Fields]) OR "Facilitators and barriers"[All Fields]) OR ((((((("incent"[All Fields] OR "incenting"[All Fields]) OR "motivation"[MeSH Terms]) OR "motivation"[All Fields]) OR "incentive"[All Fields]) OR "incentives"[All Fields]) AND ((("motivation"[MeSH Terms] OR "motivation"[All Fields]) OR "disincentive"[All Fields]) OR "disincentives"[All Fields]))) OR "Gains and losses"[All Fields]) OR "Gains and losses"[All Fields])
Cinahl
("Decision Making" OR "Decision Theory" OR "Biobehavioral Sciences" OR "Models, Theoretical" OR "Behavior and Behavior Mechanisms" OR "Feeding Behavior" OR "Decisional balance" OR "Decisional balance sheet" OR "Decision balance" OR "Balance of decisions" OR "Pros and cons" OR "pros and cons" OR "Benefits and barriers" OR "Perceived benefits and barriers" OR "Facilitators and barriers" OR " facilitators and barriers" OR "incentives and disincentives" OR "Gains and losses" OR "gains and losses") AND ("Obesity" OR "Obesity Management" OR "Overweight" OR "Weight Loss") AND ("Psychometrics" OR "Validation Study")
Web of Science
TÓPICO: ("Decision Making" OR "Decision Theory" OR "Biobehavioral Sciences" OR "Models, Theoretical" OR "Behavior and Behavior Mechanisms" OR "Feeding Behavior" OR "Decisional balance" OR "Decisional balance sheet" OR "Decision balance" OR "Balance of decisions" OR "Pros and cons" OR "pros and cons" OR "Benefits and barriers" OR "Perceived benefits and barriers" OR "Facilitators and barriers" OR " facilitators and barriers" OR "incentives and disincentives" OR "Gains and losses" OR "gains and losses") *AND* TÓPICO: ("Obesity" OR "Obesity Management" OR "Overweight" OR "Weight Loss") *AND* TÓPICO: ("Psychometrics" OR "Validation Study")
Scopus
(TITLE-ABS-KEY ("Decision Making" OR "Decision Theory" OR "Biobehavioral Sciences" OR "Models, Theoretical" OR "Behavior and Behavior Mechanisms" OR "Feeding Behavior" OR "Decisional balance" OR "Decisional balance sheet" OR "Decision balance" OR "Balance of decisions" OR "Pros and cons" OR "pros and cons" OR "Benefits and barriers" OR "Perceived benefits and barriers" OR "Facilitators and barriers" OR " facilitators and barriers" OR "incentives and disincentives" OR "Gains and losses" OR "gains and losses")) AND (TITLE-ABS-KEY ("Obesity" OR "Obesity Management" OR "Overweight" OR "Weight Loss")) AND (TITLE-ABS-KEY ("Psychometrics" OR "Validation Study"))

Supplemental Table S1: Search strategies used for each database. Brazil, 2020. (Continues)

Scielo
("Decision Making" OR "Decision Theory" OR "Biobehavioral Sciences" OR "Models, Theoretical" OR "Behavior and Behavior Mechanisms" OR "Feeding Behavior" OR "Decisional balance" OR "Decisional balance sheet" OR "Decision balance" OR "Balance of decisions" OR "Pros and cons" OR "pros and cons" OR "Benefits and barriers" OR "Perceived benefits and barriers" OR "Facilitators and barriers" OR " facilitators and barriers" OR "incentives and disincentives" OR "Gains and losses" OR "gains and losses") AND ("Obesity" OR "Obesity Management" OR "Overweight" OR "Weight Loss") AND ("Psychometrics" OR "Validation Study")
PsycINFO
Any Field: "Decision Making" *OR* **Any Field**: "Decision Theory" *OR* **Any Field**: "Biobehavioral Sciences" *OR* **Any Field**: "Models, Theoretical" *OR* **Any Field**: "Behavior and Behavior Mechanisms" *OR* **Any Field**: "Feeding Behavior" *OR* **Any Field**: "Decisional balance" *OR* **Any Field**: "Decisional balance sheet" *OR* **Any Field**: "Decision balance" *OR* **Any Field**: "Balance of decisions" *OR* **Any Field**: "Pros and cons" *OR* **Any Field**: "pros and cons" *OR* **Any Field**: "Benefits and barriers" *OR* **Any Field**: "Perceived benefits and barriers" *OR* **Any Field**: "Facilitators and barriers" *OR* **Any Field**: " facilitators and barriers" *OR* **Any Field**: "incentives and disincentives" *OR* **Any Field**: "Gains and losses" *OR* **Any Field**: "gains and losses" *AND* **Any Field**: "Obesity" *OR* **Any Field**: "Obesity Management" *OR* **Any Field**: "Overweight" *OR* **Any Field**: "Weight Loss" *AND* **Any Field**: "Psychometrics" *OR* **Any Field**: "Validation Study"
Embase
('decision making'/exp OR 'decision making' OR 'decision theory'/exp OR 'decision theory' OR 'biobehavioral sciences'/exp OR 'biobehavioral sciences' OR 'models, theoretical'/exp OR 'models, theoretical' OR 'behavior and behavior mechanisms'/exp OR 'behavior and behavior mechanisms' OR 'feeding behavior'/exp OR 'feeding behavior' OR 'decisional balance' OR 'decisional balance sheet' OR 'decision balance' OR 'balance of decisions' OR 'pros and cons' OR 'benefits and barriers' OR 'perceived benefits and barriers' OR 'facilitators and barriers' OR 'incentives and disincentives' OR 'gains and losses') AND ('obesity'/exp OR 'obesity' OR 'obesity management'/exp OR 'obesity management' OR 'overweight'/exp OR 'overweight' OR 'weight loss'/exp OR 'weight loss') AND ('psychometrics'/exp OR 'psychometrics' OR 'validation study'/exp OR 'validation study')

Supplemental Table S2: The quality assessment of the instruments' development included in the systematic review with application of the Cosmin methodology. Brazil, 2020.

	O'Connell & Velicer (1988)[24]	Akamatsu, Otake, Shimai (2003)[25]	Yeh (2005)[23]	Falchi et al. (2015)[26]	Simmons & Mesui (1999)[27]
I. Standards for evaluating the quality of the instrument design to ensure relevance of the instrument					
1. Is a clear description provided of the construct to be measure?	Very good	Very good	Very good	Very good	Inadequate
2. Is the origin of the construct clear: was a theory, conceptual framework or disease model used or clear rationale provided to define the construct to be measure?	Very good	Very good	Very good	Very good	Doubtful
3. Is a clear description provided of the target population for which the instrument was developed?	Very good	Very good	Very good	Inadequate	Very good
4. Is a clear description provided of the context of use?	Very good	Doubtful	Very good	Very good	Very good
5. Was the instrument development study performed in a sample representing the target population for which the instrument was developed?	Very good	Inadequate	Very good	Adequate	Very good
6. Was an appropriate qualitative data collection method used to identify relevant items for a new instrument?	Doubtful		Doubtful	Doubtful	Very good
7. Were skilled group moderators/interviewers used?	Not applicable		Doubtful	Not applicable	Doubtful
8. Were the group meeting or interviews based on an appropriate topic or interview guide?	Not applicable		Doubtful	Not applicable	Very good
9. Were the group meeting or interviews recorded and transcribed verbatim?	Not applicable		Doubtful	Not applicable	Doubtful
10. Was an appropriate approach used to analyze the data?	Doubtful		Doubtful	Very good	Very good
11. Was at least part of the data coded independently?	Not applicable		Inadequate	Very good	Doubtful
12. Was data collection continued until saturation was reached?	Not applicable		Doubtful	Adequate	Doubtful

Supplemental Table S2: The quality assessment of the instruments' development included in the systematic review with application of the Cosmin methodology. Brazil, 2020. (Continues)

	O'Connell & Velicer (1988)[24]	Akamatsu, Otake, Shimai (2003)[25]	Yeh (2005)[23]	Falchi et al. (2015)[26]	Simmons & Mesui (1999)[27]
13. For quantitative studies (surveys): was the sample size appropriate?	Not applicable		Inadequate	Not applicable	Not applicable
Subtotal quality concept elicitation study (lowest score of items 6-13)	**Doubtful**		**Inadequate**	**Doubtful**	**Doubtful**
Total quality of the instrument design (lowest score of items 1-13)	**Doubtful**	**Inadequate**	**Inadequate**	**Inadequate**	**Inadequate**
II. Standards for evaluating the quality of a cognitive interview study or other pilot test performed to evaluate comprehensibility and comprehensiveness of the instrument					
14. Was a cognitive interview study or other pilot test conducted?	Inadequate	Very good	Very good	Very good	Inadequate
15. Was the cognitive interview study or other pilot test performed in a sample representing the target population?		Inadequate	Adequate	Adequate	
16. Were patients asked about the comprehensibility of the instrument?		Inadequate	Very good	Very good	
17. Were all items tested in their final form?			Doubtful	Very good	
18. Was an appropriate qualitative method used to assess the comprehensibility of the instrument instructions, items, response options, and recall period?			Doubtful	Inadequate	
19. Was each item tested in an appropriate number of patients?			Doubtful	Very good	
20. Were skilled interviewers used?			Doubtful	Doubtful	
21. Were the interviews based on an appropriate interview guide?			Doubtful	Doubtful	
22. Were the interviews recorded and transcribed verbatim?			Doubtful	Inadequate	
23. Was an appropriate approach used to analyze the data?			Doubtful	Inadequate	
24. Were at least two researchers involved in the analysis?			Doubtful	Doubtful	
25. Were problems regarding the comprehensibility of the instructions, items, response options, and recall period appropriately addressed by adapting the instrument?			Doubtful	Inadequate	
Subtotal quality of comprehensibility study (lowest score of items 15-25)		**Inadequate**	**Doubtful**	**Doubtful**	

Supplemental Table S2: The quality assessment of the instruments' development included in the systematic review with application of the Cosmin methodology. Brazil, 2020.(Continues)

	O'Connell & Velicer (1988)[24]	Akamatsu, Otake, Shimai (2003)[25]	Yeh (2005)[23]	Falchi et al. (2015)[26]	Simmons & Mesui (1999)[27]
26. Were patients asked about the comprehensiveness of the instrument? (if doubtful, ship items 27 - 35)		Doubtful	Doubtful	Doubtful	
Subtotal quality of comprehensiveness study (lowest score of items 15, 26-35)		Inadequate	Doubtful	Doubtful	
Total quality of the pilot study (lowest score of items 14-35)	Inadequate	Inadequate	Doubtful	Inadequate	Inadequate
Total quality of the instrument development study (lowest score of items 1-35)	Inadequate	Inadequate	Inadequate	Inadequate	Inadequate

Supplemental Table S3: The quality assessment of the content validity study of the instruments using the Cosmin methodology. Brazil, 2020.

	O'Connell & Velicer (1988)[24]	Akamatsu, Otake, Shimai (2003)[25]	Yeh (2005)[23]	Falchi et al. (2015)[26]	Simmons & Mesui (1999)[27]
I. Asking patients about the relevance of the instrument items					
1. Was an appropriate method used to ask patients whether each item is relevant for their experience with the condition?					Very good
2. Was each item tested in an appropriate number of patients?					Very good
3. Were skilled group moderators/interviewers used?					Doubtful
4. Were the group meetings or interviews based on an appropriate topic or interview guide?					Very good
5. Were the group meeting or interviews recorded and transcribed verbatim?					Doubtful
6. Was an appropriate approach used to analyze the data?					Very good
7. Were at least two researchers involved in the analysis?					Doubtful
Subtotal quality of relevance study (lowest score of items 1-7)					Doubtful
II. Asking patients about the comprehensiveness of the instrument	No study asked patients about the comprehensiveness.				
III. Asking patients about the comprehensibility of the instrument					
15. Was an appropriate qualitative method used for assessing the comprehensibility of the instrument instructions, items, response options, and recall period?			Doubtful	Inadequate	
16. Was each item tested in an appropriate number of patients?			Doubtful	Very good	
17. Were skilled group moderators/interviewers used?			Doubtful	Doubtful	
18. Were the group meetings or interviews based on an appropriate topic or interview guide?			Doubtful	Doubtful	

Supplemental Table S3: The quality assessment of the content validity study of the instruments using the Cosmin methodology. Brazil, 2020. (Continues)

	O'Connell & Velicer (1988)[24]	Akamatsu, Otake, Shimai (2003)[25]	Yeh (2005)[23]	Falchi et al. (2015)[26]	Simmons & Mesui (1999)[27]
19. Were the group meeting or interviews recorded and transcribed verbatim?			Doubtful	Inadequate	
20. Was an appropriate approach used to analyze the data?			Doubtful	Inadequate	
21. Were at least two researchers involved in the analysis?			Doubtful	Doubtful	
Subtotal quality of comprehensibility study (lowest score of items 15-21)			**Doubtful**	**Inadequate**	
IV. Asking professionals about the relevance of the instrument items					
22. Was an appropriate method used to ask professionals whether each item is relevant for the construct of interest?	Adequate				
23. Were professionals from all relevant disciplines included?	Doubtful				
24. Was each item tested in an appropriate number of professionals?	Doubtful				
25. Was an appropriate approach used to analyze the data?	Doubtful				
26. Were at least two researchers involved in the analysis?	Doubtful				
Subtotal quality of relevance study (lowest score of items 22-26)	Doubtful				
V. Asking professionals about the comprehensiveness of the instrument					
27. Was an appropriate method used for assessing the comprehensiveness of the instrument?	Adequate				
28. Were professionals from all relevant disciplines included?	Doubtful				
29. Was each item tested in an appropriate number of professionals?	Doubtful				
30. Was an appropriate approach used to analyze the data?	Doubtful				
31. Were at least two researchers involved in the analysis?	Doubtful				
Subtotal quality of comprehensiveness study (lowest score of items 27-31)	Doubtful				

Supplemental Table S4: The quality assessment of the other instruments measurement properties study using the Cosmin methodology. Brazil, 2020.

	O'Connell & Velicer (1988)[24]	Akamatsu, Otake, Shimai (2003)[25]	Yeh (2005)[23]	Falchi et al. (2015)[26]	Simmons & Mesui (1999)[27]
Structural validity					
1. Does the scale consist of the effect indicators, i.e. is it based on a reflective model?	Yes	Yes	Yes		Yes
2. Does the study concern unidimensionality or structural validity?	Unidimensionality	Unidimensionality	Unidimensionality		Unidimensionality
2.1. For Classic Test Theory (CTT): was exploratory or confirmatory factor analysis performed?	Adequate	Adequate	Very good		Inadequate
2.2. For Item Response Theory(IRT)/Rasch: does the chosen model fit to the research question?	Not applicable	Not applicable	Not applicable		Not applicable
2.3. Was the sample size included in the analysis adequate?	Inadequate	Very good	Very good		Not applicable
2.4. Were there any other important flaws in the design or statistical methods of the study?	Inadequate	Inadequate	Inadequate		Inadequate
Total structural validity (lowest score of items 2.1 - 2.4)	Inadequate	Inadequate	Inadequate		Inadequate
Internal consistency					
1. Does the scale consist of effect indicators, i.e. is it based on a reflexive model?	Yes	Yes	Yes	Yes	Yes
1.1. Was an internal consistency statistic calculated for each unidimensional scale or subscale separately?	Very good	Very good	Very good	Inadequate	Inadequate
2. For continuous scores: was Cronbach's alpha or omega calculated?	Very good	Very good	Very good	Very good	Very good
3. For dichotomous scores: was Cronbach's alpha or KR-20 calculated?	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
4. For IRT-based scores: was standard error of the theta (SE [θ]) or reliability coefficient of estimated latent trait value (index of [subject or item] separation) calculated?	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable

Supplemental Table S4: The quality assessment of the other instruments measurement properties study using the Cosmin methodology. Brazil, 2020. (Continues)

	O'Connell & Velicer (1988)[24]	Akamatsu, Otake, Shimai (2003)[25]	Yeh (2005)[23]	Falchi et al. (2015)[26]	Simmons & Mesui (1999)[27]
Total internal consistency (lowest score of items 1 - 4)	Very good	Very good	Very good	Inadequate	Inadequate
Assessing risk of bias in a study on cross-cultural validity/measurement invariance					
1. Were the samples similar for relevant characteristics except for the group variable?		Inadequate	Inadequate	Doubtful	
2. Was an appropriate approach used to analyze the data?		Inadequate	Very good	Inadequate	
3. Was the sample size included in the analysis adequate?		Very good	Very good	Inadequate	
Total cross-cultural validity/measurement invariance (lowest score of items 1 - 3)		Inadequate	Inadequate	Inadequate	
Assessing risk of bias in a study on reliability					
1. Were patients stable in the interim period on the construct to be measured?		Adequate		Adequate	
2. Was the time interval appropriate?		Very good		Very good	
3. Were the test conditions similar for the measurements?		Doubtful		Doubtful	
4. For continuous scores: was an intraclass correlation coefficient (ICC) calculated?		Doubtful		Doubtful	
5. For dichotomous/nominal/ordinal scores: was kappa calculated?		Not applicable		Not applicable	
6. For ordinal scores: was a weighted kappa calculated?		Not applicable		Not applicable	
7. For ordinal scores: was the weighting scheme described?		Not applicable		Not applicable	
8. Were there any other important flaws in the design or statistical methods of the study?		Doubtful		Doubtful	
Total reliability (lowest score of items 1-8)		Doubtful		Doubtful	

Supplemental Table S4: The quality assessment of the other instruments measurement properties study using the Cosmin methodology. Brazil, 2020. (Continues)

	O'Connell & Velicer (1988)[24]	Akamatsu, Otake, Shimai (2003)[25]	Yeh (2005)[23]	Falchi et al. (2015)[26]	Simmons & Mesui (1999)[27]
Assessing risk of bias in a study on hypotheses testing for construct validity					
I-Comparison with other outcome measurement instruments (convergent validity)					
1. Is it clear what the comparator instrument(s) measure(s)?		Very good			
2. Were the measurement properties of the comparator instrument(s) sufficient?		Inadequate			
3. Were design and statistical methods adequate for the hypotheses to be tested?		Adequate			
Total I (convergent validity) (lowest scores of items 1 - 3)		**Inadequate**			
II-Comparison between subgroups (discriminative or known-groups validity)					
1. Was an adequate description provided of important characteristic of the subgroups?	Doubtful	Doubtful	Doubtful	Doubtful	Doubtful
2. Were design and statistical methods adequate for hypotheses to be tested?	Adequate	Doubtful	Adequate	Very good	Doubtful
Total II (discriminative or know-groups validity) (lowest score of items 1 - 2)	**Doubtful**	**Doubtful**	**Doubtful**	**Doubtful**	**Doubtful**

REFERENCES

1. (NCD-RisC) NRFC. Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128.9 million children, adolescents, and adults. Lancet. 2017;390(10113):2627–42. https://doi.org/10.1016/S0140-6736(17)32129-3
2. Afshin A, Forouzanfar MH, Reitsma MB, Sur P, Estep K, Lee A, et al. Health Effects of Overweight and Obesity in 195 Countries over 25 Years. N Engl J Med. 2017;377(1):13–27. https://doi.org/10.1056/NEJMoa1614362
3. Tremmel M, Gerdtham UG, Nilsson PM, Saha S. Economic Burden of Obesity: A Systematic Literature Review. Int J Env Res Public Health. 2017;14(4):18. https://doi.org/10.3390/ijerph14040435
4. Robinson E, Roberts C, Vainik U, Jones A. The psychology of obesity: An umbrella review and evidence-based map of the psychological correlates of heavier body weight. Neurosci Biobehav Rev. 2020;119:13. https://doi.org/10.1016/j.neubiorev.2020.10.009
5. Silva LES da, Oliveira MM de, Stopa SR, Gouvea E de CDP, Ferreira KRD, Santos R de O, et al. Tendência temporal da prevalência do excesso de peso e obesidade na população adulta brasileira, segundo características sociodemográficas, 2006-2019. Epidemiol E Serviços Saúde. 2021;30(1). https://doi.org/10.1590/s1679-49742021000100008
6. Silva AG da, Teixeira RA, Prates EJS, Malta DC. Monitoramento e projeções das metas de fatores de risco e proteção para o enfrentamento das doenças crônicas não transmissíveis nas capitais brasileiras. Ciênc Saúde Coletiva. 2021;26(4):1193–206. https://doi.org/10.1590/1413-81232021264.42322020
7. Menezes MC, Duarte CK, Costa DVP, Lopes MS, Freitas PP, Campos SF, et al. A systematic review of effects, potentialities, and limitations of nutritional interventions aimed at managing obesity in primary and secondary health care. Nutrition. 2020;75–76:110784. https://doi.org/10.1016/j.nut.2020.110784
8. Prochaska JO, Diclemente CC, Norcross JC. In search of how people change. Applications to addictive behaviors. Am Psychol. 1992;47(9):1102.
9. Prochaska JO, Velicer WF. The transtheoretical model of health behavior change. Am J Health Promot. 1997;12(1):38–48.
10. Prochaska JO, Norcross JC, DiClemente CC. Applying the stages of change. Psychother Aust. 2013;19(2):10–5.
11. Joseph RP, Daniel CL, Thind H, Benitez TJ, Pekmezi D. Applying Psychological Theories to Promote Long-Term Maintenance of Health Behaviors. Am J Lifestyle Med. 2016;10(6):13. https://doi.org/10.1177/1559827614554594
12. Menezes MC, Bedeschi LB, Santos LC, Lopes ACS. Interventions directed at eating habits and physical activity using the Transtheoretical Model: a systematic review. Nutr Hosp. 2016;33(5):1194–204. https://doi.org/10.20960/nh.586
13. Brasil. Estratégias para o cuidado da pessoa com doença crônica: obesidade. Brasília: Ministério da Saúde; 2014 p. 212.
14. Mendes, Eugênio Vilaça. O cuidado das condições crônicas na atenção primária à saúde: o imperativo da consolidação da estratégia da saúde da família. Brasília: Organização Pan-Americana da Saúde; 2012. 512 p.
15. Brasil. Instrutivo de Abordagem Coletiva para manejo da obesidade no SUS. Brasília: Ministério da Saúde; 2021. 145 p.
16. Freitas PP, Menezes MC, Santos LC, Pimenta AM, Ferreira AVM, Lopes ACS. The transtheoretical model is an effective weight management intervention: a randomized controlled trial. BMC Public Health. 2020;20(1):652. https://doi.org/10.1186/s12889-020-08796-1
17. Prochaska JO, Velicer WF, Rossi JS, Goldstein MG, Marcus BH, Rakowski W, et al. Stages of change and decisional balance for 12 problem behaviors. Health Psychol. 1994;13(1):39–46. https://doi.org/10.1037/0278-6133.13.1.39
18. Rogerson D, Soltani H, Copeland R. The weight-loss experience: a qualitative exploration. BMC Public Health. 2016;16(1):371. https://doi.org/10.1186/s12889-016-3045-6
19. Morgan C, de Wildt G, Prado RBR, Thanikachalam N, Virmond M, Riley R. Views and Experiences of Adults who are Overweight and Obese on the Barriers and Facilitators to Weight Loss in Southeast Brazil: A Qualitative Study. Int J Qual Stud Health Well-Being. 2020;15(1):1852705. https://doi.org/10.1080/17482631.2020.1852705
20. Mokkink LB, de Vet HCW, Prinsen CAC, Patrick DL, Alonso J, Bouter LM, et al. COSMIN Risk of Bias checklist for systematic reviews of Patient-Reported Outcome Measures. Qual Life Res. 2017;27(5):9. https://doi.org/10.1007/s11136-017-1765-4

21. Prinsen CAC, Mokkink LB, Bouter LM, Alonso J, Patrick DL, de Vet HCW, et al. COSMIN guideline for systematic reviews of patient-reported outcome measures. Qual Life Res. 2018;27(5):11. https://doi.org/10.1007/s11136-018-1798-3
22. Terwee CB, Prinsen CAC, Chiarotto A, Westerman MJ, Patrick DL, Alonso J, et al. COSMIN methodology for evaluating the content validity of patient-reported outcome measures: a Delphi study. Qual Life Res. 2018;27(5):1159–70. https://doi.org/10.1007/s11136-018-1829-0
23. Yeh, Y. Applicability of the transtheoretical model in weight management in an adolescent population in Taiwan. [US]: University of Rhode Island; 2005.
24. O'Connell D, Velicer WF. A decisional balance measure and the stages of change model for weight loss. Int J Addict. 1988;23(7):729–50. https://doi.org/10.3109/10826088809058836
25. Akamatsu R, Otake K, Shimai S. A decisional balance measure and the stages of change model of weight loss: Development and the reliability and validity of the Japanese edition of the Decisional Balance Inventory. Jpn J Health Psychol. 2003;16(2):9. https://doi.org/10.11560/jahp.16.2_1
26. Falchi AG, Muggia C, Grecchi I, Michelini I, Silvestri AD, Tinelli C. Validation of decisional balance inventory test in Italian: assessment of motivation in weight loss. Ital J Med. 2015;9(3):268–72. https://doi.org/10.4081/itjm.2015.520
27. Simmons D, Mesui J. Decisional balance and stage of change in relation to weight loss, exercise and dietary fat reduction among Pacific Islands people. Asia Pac J Clin Nutr. 1999;8(1):39–45. https://doi.org/10.1046/j.1440-6047.1999.00080.x
28. Iskander JK, Wolicki SB, Leeb RT, Siegel PZ. Successful Scientific Writing and Publishing: A Step-by-Step Approach. Prev Chronic Dis. 2018;15:E79. https://doi.org/10.5888/pcd15.180085
29. Damásio BF. Uso da análise fatorial exploratória em psicologia. Aval Psicológica. 2012;11(2):213–28.
30. Araujo EAC de, Andrade DF de, Bortolotti SLV. Item Response Theory. Rev Esc Enferm USP. 2009;43:8.https://doi.org/10.1590/S0080-62342009000500003
31. Hall KL, Rossi JS. Meta-analytic examination of the strong and weak principles across 48 health behaviors. Prev Med. 2008;46(3):9. https://doi.org/10.1016/j.ypmed.2007.11.006
32. McVay MA, Yancy WS, Bennett GG, Jung SH, Voils CI. Perceived barriers and facilitators of initiation of behavioral weight loss interventions among adults with obesity: a qualitative study. BMC Public Health. 2018;18(1):11. 10.1186/s12889-01https://doi.org/8-5795-9
33. Oliveira APSV, Silva MM. Factors that difficult the loss of weight in obese women of degrees I and II. Rev Psicol E Saúde. 2014;6(1):9.

Contributors

Santos TSS, Carvalho MCR, and Duarte CK identified the studies. Santos TSS and Carvalho MCR screened the studies with data extraction, quality analysis, and synthesis; wrote the first version of the manuscript with contributions from Duarte CK and Lopes ACS. All authors were involved with the conception and design of the study and reviewed subsequent versions, including approval of the final version.

Conflict of Interests: The authors declare that there is no conflict of interest.

Received:December 21, 2022
Accepted:April 27, 2023