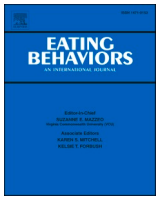
Eating Behaviors 46 (2022) 101659

Contents lists available at ScienceDirect

Eating Behaviors

journal homepage: www.elsevier.com/locate/eatbeh



Review and meta-analysis for the caregiver's feeding styles questionnaire administered to low-income families

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ARTICLE INFO

Keywords:
Parent feeding
Feeding styles
Cutoff points
Meta-analysis
Low-income families
Caregiver's feeding styles questionnaire
BMI z-scores

ABSTRACT

The Caregiver's Feeding Styles Questionnaire (CFSQ) is a well-established measure which uses scores along two dimensions of demandingness and responsiveness to classify low-income parents into one of four feeding style typologies (authoritative, authoritarian, indulgent, and uninvolved; Hughes, et al., 2005). The measure is widely used by researchers to explore the relationship between feeding style and child weight status but has not been evaluated comprehensively in a review or meta-analysis. The aims of this study were to 1) compare established median cutoffs for responsiveness and demandingness in parent feeding ($k = 5$; see Hughes et al., 2012) to current median splits along these two dimensions for a larger sample of articles ($k = 19$) and 2) evaluate the relation between children's BMI, demandingness and responsiveness, and parent feeding style categories. Results indicated that the cutoffs for responsiveness and demandingness initially established based on five studies of low-income families did not differ significantly with the addition of 19 studies. Child BMI z-scores ($k = 8$) were above average for all four parent feeding style categories and highest for indulgent parents, which was consistent with the literature outlining low-income children at higher risk for obesity and children of indulgent parents being particularly at risk. While heterogeneity of samples should be considered, study results suggested that the CFSQ distribution for responsiveness and demandingness was relatively generalizable across low-income samples, though heterogeneity was higher among caregiver's feeding style categories. Furthermore, the study confirmed that parent feeding styles were related to child weight status in a meaningful way, but all children in these low-income samples, on average, were heavier than their same-aged peers across all parent feeding styles.

1. Background

Childhood obesity remains an enduring focus in public health and nutrition research due to the sustained risk in modern times and the multitude of negative consequences on children's health and wellbeing (Ogden et al., 2012). While these consequences impact children universally, racial and ethnic and socioeconomic disparities are ubiquitous. Rates of childhood obesity are disproportionately higher in racial and ethnic minority groups and low-income populations (Anderson & Butcher, 2006; Kumanyika et al., 2008; Whitaker et al., 2009). As a result, researchers across disciplines have focused their efforts to explore contextual factors influencing rates of childhood obesity specifically in low-income populations (Appelhans et al., 2014; Eagle et al., 2012). One focus of research has been on parent feeding styles, which allow for the investigation of correlates and consequences of different parental approaches to establishing expectations and attitudes around mealtimes with their children (Birch et al., 2001; Faith et al., 2004; Hurley et al., 2011; Vollmer, Mobley, 2013a, 2013b). Similar to general parenting styles as proposed by Diane Baumrind (1967) and modified by Maccoby and Martin (1983), high and low scores on parents' demandingness and

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https://doi.org/10.1016/j.eatbeh.2022.101659
Received 15 February 2022; Received in revised form 29 June 2022; Accepted 26 July 2022
Available online 29 July 2022

responsiveness during eating episodes translate into four feeding style categories: authoritative, authoritarian, indulgent, and uninvolved. Parents higher on demandingness are those that make more demands on their children to eat during eating episodes. In contrast, parents higher on responsiveness are those who use child-centered approaches (e.g., fostering individuality while being attuned to the child's needs) with their child during eating (Hughes et al., 2012). Parents higher in responsiveness are likely to employ tactics to encourage autonomous good decision-making, such as helping children identify healthy foods and explain how they help them grow.

1.1. Caregiver's Feeding Styles Questionnaire (CFSQ)

The Caregiver's Feeding Styles Questionnaire (CFSQ) is a 19-item parent-report questionnaire that includes 7 child-centered items (asking questions, reasoning, and providing choice) and 12 parent-centered items (showing disapproval, providing rewards, and pressuring the child to eat; Hughes et al., 2005, 2012). These child-centered and parent-centered items are used to develop two dimensions of demandingness and responsiveness. Scores along these dimensions classify parents into one of the four feeding style typologies (authoritarian, authoritative, indulgent, and uninvolved). Authoritative parents are those who use non-directive strategies to get their children to eat while taking into account individual differences in eating behaviors (Hughes et al., 2005). Authoritarian parents expect strict obedience and use highly directive strategies with their children during eating episodes. Indulgent parents use few strategies during eating episodes to get their child to eat but the few strategies they use are highly responsive. Uninvolved parents also use few strategies during eating episodes with their child but the strategies they use are not responsive.

The measure is well-established in the literature with good reliability and validity, as discussed in detail by the original authors (Hughes et al., 2005) and confirmed across almost two decades of use (exhaustive list of publications utilizing the CFSQ from 2005 to 2020 available from the corresponding author upon request). The tool was developed specifically for low-income racial and ethnic minority families and has been used extensively with Head Start parents of preschoolers (Hughes et al., 2005, 2012). However, the tool has also been used with low-income parents of children up to eleven years of age (Hennessy et al., 2010, 2012). In 2012, Hughes and colleagues recommended cutoff scores for creating quadrants along the two dimensions of responsiveness and demandingness by providing the average median scores from over 1300 parents from five studies with samples of predominantly minority low-income families across the United States (Hughes et al., 2012). As such, the authors recommended limiting the use of these cut-offs to specifically low-income families in the United States and listed the exploration of these cutoffs in different socioeconomic groups, races, and ethnicities as points of future direction (Hughes et al., 2012). The current study intends to better understand the generalizability of these cut-offs for low-income families by expanding the number of samples with low-income families using articles published since the original cutoff scores were established.

1.2. Feeding styles and BMI

Reviews examining parent feeding styles using the CFSQ and other related measures have reported significant associations between parental feeding and child BMI z-score or weight status (Hughes & Power, 2021; Hurley et al., 2011; Vollmer, Mobley, 2013b). Parents who are categorized as ascribing to an authoritative feeding style (high on both responsiveness and demandingness) have children who are at a reduced risk for developing obesity (Tovar et al., 2012). Similarly, the authoritarian feeding style (high on demandingness, low on responsiveness) has been associated with the lowest child BMI (Hughes et al., 2005; Hughes et al., 2008; Hughes et al., 2016). These feeding styles have been described as protective factors for child health outcomes and their commonality of high on demandingness suggests this continuous measure of feeding style might be influential on child outcomes. In contrast, the indulgent feeding style (high on responsiveness, low on demandingness) is most associated with a higher child weight status, low-nutrient-dense food intake, and childhood obesity (Hennessy et al., 2010; Hughes et al., 2005, 2008, 2011; Tovar et al., 2012). In one study, the indulgent feeding style accounted for 26 % of the variance in child BMI z-score, indicating the potential to be a strong predictor of child weight status (Tovar et al., 2012). When compared to authoritarian parents, BMI z-scores of children with uninvolved parents have been found to be significantly higher (Frankel et al., 2014), though this association has not been explored consistently in the literature. However, researchers have consistently shown an association between low-income status and higher BMI or child-weight status (Shriver et al., 2019; Worobey & Trytko, 2014) signaling an important focus on research targeting this at-risk group.

1.3. The current study

The goal of the current study was to review the existing literature to expand on Hughes' recommendations for demandingness and responsiveness cut-off scores on the CFSQ and provide the unique addition of exploring the relationship between the CFSQ and BMI using a meta-analytic technique. The first specific aim of this study was to expand upon Hughes' 2012 summary ($k = 5$) of parent feeding style averages by adding 19 study samples for estimating the average median scores for demandingness and responsiveness in feeding among low-income samples and the dispersion of parent feeding styles across these samples. The second aim was to determine the prevalence of each of the feeding style categories as well as determine the average demandingness and responsiveness in feeding across low-income families in the U.S. In addition, this study aimed to examine the average effect size between BMI and demandingness and responsiveness and calculate and compare the average BMI across these four parent feeding style categories (authoritative, authoritarian, indulgent, uninvolved).

2. Method

2.1. Literature search

Relevant articles were found by using the “Cited by” function in Google Scholar and identifying all articles on the database that cited the original 2005 article by Sheryl O. Hughes which introduced the CFSQ (Hughes et al., 2005). 683 publications were identified in the original search conducted in October 2019 (see Fig. 1). The search was narrowed to include only published studies (excluding theses, dissertations, and book chapters) written in English and published after 2012 when the cut-off scores were recommended. The full text of the remaining sample of 420 articles was screened to determine if the authors cited the CFSQ as a source or used the questionnaire as a measure in their study. The 52 articles which used the CFSQ as a measure were screened once more to determine if they met the criteria of reporting on a low-income sample (qualification for Head Start, Women Infants, and Children (WIC) or the Supplemental Nutrition Assistance Program (SNAP)). Articles with identical sample characteristics (i.e., that were published using the same study sample) were grouped to create 19 distinct study groupings in addition to the five studies summarized in Hughes' original cut-off score article (Hughes et al., 2012). Information about these five studies can be found in the original CFSQ cutoff article (see Table 1; Hughes et al., 2012). In this paper, articles can be defined as distinct publications with unique authors and studies, represented by *k*, are the groupings of publications according to identical sample characteristics.

Each study was double coded for sample characteristics such as race and ethnicity, whether the children attended Head Start, geographic location, rural vs urban settings, and which caregivers were targeted (i.e., mothers, fathers, grandparents, etc.). In addition, articles were

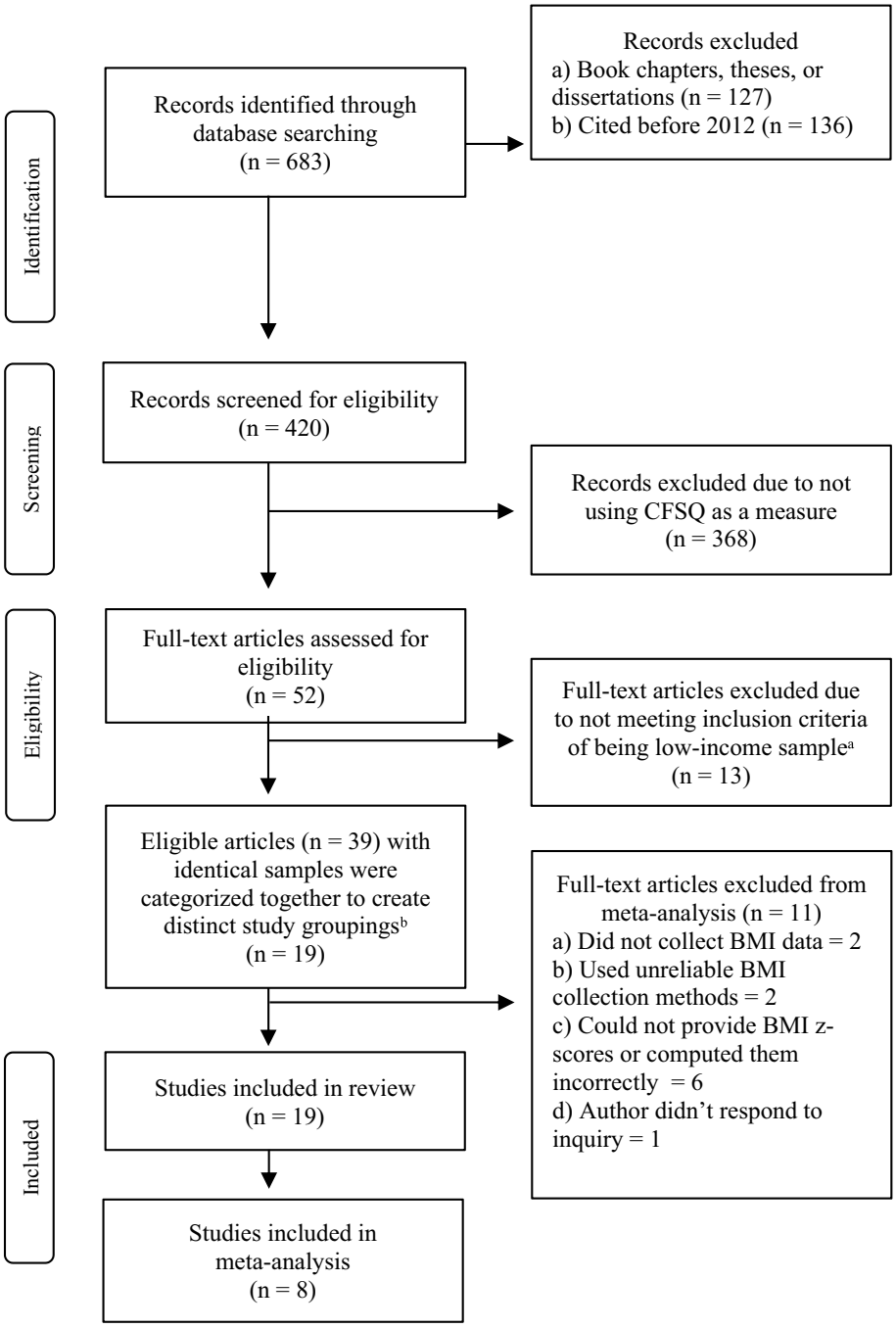

Fig. 1. PRISMA flow diagram of literature review and selection process for CFSQ review and meta-analysis.
[a] Low-income status is determined by qualifying for Head Start or another federal assistance program (WIC, SNAP) and, when in question, was verified with an author
[b] Articles can be defined as distinct publications with unique authors and studies are the groupings of publications according to sample characteristics.

double-coded for whether they used the CFSQ in a manner that was variable-centered, person-centered, or both, their sample's demandingness and responsiveness cut-off, the percentage of each parenting-style category, and whether or not they used the recommended cut-off score provided by Hughes. Studies were also coded regarding their use of the full 19-item CFSQ or a variation (e.g., using only some items or using the entire 19-item questionnaire in conjunction with items from a different questionnaire).

Corresponding authors were contacted for each of these 19 studies to provide any information that was not readily accessible in their article, verify study information including the low-income status of participants and to confirm the accuracy of a brief summary that synthesized the study's main findings (See supplementary text). Authors were also asked for data specific to child BMI to determine eligibility for the meta-analysis. A subset of authors ($k = 8$) were able to provide data specific to this aim. The other studies ($k = 11$) either: (a) did not collect child BMI data, (b) used unreliable child BMI collection methods (e.g., parent-report), (c) could not provide BMI z-scores or computed these incorrectly, or (d) did not respond to our inquiries.

Table 1 organizes each study's sample size, the number of studies reporting on a given sample, geographic location, racial and ethnic breakdown, and demandingness and responsiveness in feeding scores. Table 2 provides the breakdown of parent feeding style across studies.

Table 1
Summary of studies for CFSQ responsiveness and demandingness review with sample race and ethnicity breakdown.

Study Authors	*k*	*n*	Geographic Location	Race and Ethnicity						D	R
				AA	H	W	NA	AA/PI	Other		
				n (%)							
Entire Sample	19	5005								2.66	1.25
Hughes et al., 2012	5	1359								2.82	1.16
Vollmer, Mobley, 2013a	1	30	Central & Northwest IN	10 (33)	10 (33)	10 (33)	–	–	–	2.55	1.24
Fisher et al., 2013	1	60	–	18 (30)	26 (43)	12 (20)	–	4 (7)	–	–	–
Worobey, 2018; Worobey & Trytko, 2014	2	80	Greater New Brunswick, NJ	9 (11)	71 (89)	–	–	–	–	2.89	1.16
Hennessy et al., 2012*	1	99	Rural Central Valley CA; Appalachia (KY, TN, SC, GA); Mississippi River Delta (MS, AR)	48 (48)	22 (22)	29 (29)	–	–	–	2.63	1.21
Ontai et al., 2016	1	119	Sacramento, CA; Northern CA	21 (17.3)	44 (37)	34 (28.3)	3 (2.4)	10 (8.7)	4 (3.4)	1.23	2.31
Boucher, 2014; Boucher, 2016	2	126	Southeastern MI	83 (65)	7 (8)	29 (22)	1 (1)	1 (1)	5 (3)	–	–
O'Connor et al., 2019; Power et al., 2018; Silva Garcia et al., 2018; Arlinghaus et al., 2018*	4	177	Houston, TX	97 (55)	80 (45)	–	–	–	–	3.00	1.14
Hughes et al., 2016; Silva Garcia et al., 2018; Kamdar et al., 2019; Hidalgo-Mendez et al., 2019; Power et al., 2015*	5	187	Houston, TX	–	187 (100)	–	–	–	–	3.05	1.19
Lora et al., 2016	1	200	Oklahoma City, OK	–	–	–	–	–	–	2.62	1.25
Ip et al., 2018	1	248	NC (cities unspecified)	–	248 (100)	–	–	–	–	2.23	0.85
Power et al., 2019*	1	255	Houston, TX; Rural Central WA	–	255 (100)	–	–	–	–	2.89	1.14
Shriver et al., 2019	1	281	Greensboro, NC; Ashboro, NC; Boone, NC; Chapel Hill, NC	106 (38)	100 (35)	75 (27)	–	–	–	2.74	1.18
Morrison et al., 2013; Frankel et al., 2014; Frankel et al., 2015; Hughes et al., 2015	4	296	Houston, TX	139 (47)	157 (53)	–	–	–	–	2.95	1.15
Mosli et al., 2016; Goulding et al., 2014; Mosli et al., 2015; Fernandez et al., 2020; Pesch et al., 2020*	5	330	Ann Arbor, MI; Jackson, MI; Ypsilanti, MI; Lansing, MI; Rural Southcentral MI	54 (16.4)	39 (11.8)	177 (53.6)	1 (0.3)	2 (0.61)	57 (17.3)[c]	2.68	1.25
Savage et al., 2017	1	334	Central PA	53 (16)	–	241 (72)	–	–	40 (12)	2.61	1.31
Tovar et al., 2012; Tovar et al., 2013; Tovar et al., 2015*	3	387	Greater Boston, MA	–	114 (29.5)	–	–	–	217 (69.3)[a]	3.05	1.11
Hughes et al., 2017; Musaad et al., 2017*	2	432	Southern NV; Northern NV; CT; OK, NJ, CA	82 (18.9)	192 (44.4)	101 (23.4)	23 (5.3)	–	34 (7.9)	2.8	1.3
Papaioannou et al., 2013	1	667	Houston, TX; Birmingham, AL; Rural Northeast AL	293 (43.9)	199 (29.8)	175 (26.2)	–	–	–	–	–
Horodynski et al., 2018*	1	697	Rural MI	205 (29.6)	84 (12.1)	335 (48.4)	2 (0.29)	–	62 (9.0)[b]	2.74	1.21

Note. AA = African American, H = Hispanic; W = White, NA = Native American, AA/PI = Asian American and Pacific Islander, and Other ([a]Brazilian & Haitian, [b]Biracial, [c]Biracial, non-Hispanic), D = Demandingness, R = Responsiveness. Studies included in the meta-analysis are denoted with an asterisk (*).

2.2. Analyses

All analyses were conducted using the Comprehensive Meta-Analysis software (Borenstein et al., 2005). A random effects model was chosen because it was assumed that heterogeneity beyond normal sampling errors existed between studies and there was a distribution of effect sizes across studies (Borenstein et al., 2010). To examine consistency across studies and test for the appropriateness of combining studies in a meta-analysis, heterogeneity was examined using I^2, which can be interpreted as the percentages of total variation across studies within a meta-analysis. This measure of heterogeneity can be negative, which would be corrected to zero by the statistical package. Percentages below 25 % can be interpreted as low; moderate would be between 50 %–75 % and high would be above 75 % (Higgins et al., 2003). Meta-analyses that report moderate and high heterogeneity should be interpreted with caution, as this may suggest variation across studies, or inconsistencies, to a degree that the synthesis of the studies is not meaningful. The Classic Fail-Safe Test was available as part of the Comprehensive Meta-Analysis software (Borenstein et al., 2005) to measure publication bias in this study. Cohens *d* was used to determine effect sizes of BMI z-score mean differences between parent feeding style categories (Centre for Evaluation & Monitoring, 2021). Pearson's correlation coefficient was used to measure bivariate associations between responsiveness, demandingness, and BMI z-score. Mean differences weighted by sample size between BMI z-score and parent feeding style categories were evaluated.

3. Results

The 19 total study groupings represent a large sample of families (n = 5005) from a variety of geographic locations across the U.S. in rural and urban settings (see Table 1) with diverse racial and ethnic backgrounds. A vast majority of families represented in this study met the criteria of being low-income and therefore, our findings present little socioeconomic diversity, consistent with our aims. Eight studies in this paper had sufficient data to address the third aim of this report, which

Table 2
Summary of studies for CFSQ feeding style categories.

Study Authors	*k*	*n*	Feeding Styles			
			Authoritative	Authoritarian	Indulgent	Uninvolved
			n (%)			
Entire Sample	19	5005	829 (19.1)	1418 (30.1)	1475 (31.0)	869 (19.7)
Hughes et al., 2012	5	1359	226 (17)	426 (31)	451 (33)	256 (19)
Vollmer, Mobley, 2013a	1	30	5 (17)	10 (33)	9 (30)	6 (20)
Fisher et al., 2013	1	60	16 (27)	17 (28)	14 (23)	13 (22)
Worobey, 2018; Worobey & Trytko, 2014	2	80	17 (21)	24 (30)	23 (29)	16 (20)
Hennessy et al., 2012*	1	99	15 (15)	26 (26)	37 (37)	21 (21)
Ontai et al., 2016	1	119	21 (17.9)	33 (28.2)	37 (31.6)	26 (22.2)
Boucher, 2014; Boucher, 2016	2	126	32 (25)	32 (25)	35 (29)	27 (21)
O'Connor et al., 2019; Power et al., 2018; Silva Garcia et al., 2018; Arlinghaus et al., 2018*	4	177	36 (20.3)	54 (30.5)	51 (28.8)	36 (20.3)
Hughes et al., 2016; Silva Garcia et al., 2018; Kamdar et al., 2019; Hidalgo-Mendez et al., 2019; Power et al., 2015*	5	187	30 (16)	66 (35.3)	62 (33.2)	29 (15.5)
Lora et al., 2016	1	200	–	–	–	–
Ip et al., 2018	1	248	82 (33.1)	48 (19.4)	42 (16.9)	76 (30.7)
Power et al., 2019*	1	255	43 (19.3)	70 (33.9)	73 (30.7)	36 (16.1)
Shriver et al., 2019	1	281	49 (17.4)	81 (28.8)	89 (31.7)	58 (20.6)
Morrison et al., 2013; Frankel et al., 2014; Frankel et al., 2015; Hughes et al., 2015	4	296	58 (19.6)	81 (27.4)	93 (31.4)	64 (21.6)
Mosli et al., 2016; Goulding et al., 2014; Mosli et al., 2015; Fernandez et al., 2020; Pesch et al., 2020*	5	330	51 (15.7)	114 (35.2)	109 (33.6)	50 (15.4)
Savage et al., 2017	1	334	40 (16.3)	72 (29.4)	86 (35.1)	47 (19.2)
Tovar et al., 2012; Tovar et al., 2013; Tovar et al., 2015*	3	387	60 (15.6)	126 (32.5)	132 (34)	69 (17.9)
Hughes et al., 2017; Musaad et al., 2017*	2	432	55 (12.7)	146 (33.8)	161 (37.3)	70 (16.2)
Papaioannou et al., 2013	1	667	109 (16.3)	204 (30.6)	224 (33.6)	130 (19.5)
Horodynski et al., 2018*	1	697	110 (17.8)	214 (34.7)	198 (32.1)	95 (15.4)

Note. Tovar was included because only a subsample of the larger sample was in cut-off score. Studies included in the meta-analysis are denoted with an asterisk (*).

was to determine the average effect size between child BMI and demandingness and responsiveness. Authors were requested to provide raw BMI, BMI z-scores, and BMI percentile ranking if available, and most authors provided child BMI z-scores which will be the only weight outcome in this report.

3.1. Expansion of Hughes 2012 study

Table 3 addresses the first aim of this report, which was to evaluate the generalizability of the cutoffs set by Hughes et al. (2012). Studies were separated according to those which used only the full 19-item CFSQ ($n = 2147$) or those which used a variation including those which added additional items or removed items to meet their study needs ($n = 2005$). Average responsiveness and demandingness scores from these groups were compared to the averages from the five studies presented in Hughes' 2012 paper ($n = 1359$). The average scores for demandingness ($M = 2.82$, $SD = 0.14$) and responsiveness ($M = 1.16$, $SD = 0.03$) established as the original cut-off values (Hughes et al., 2012) appeared similar to demandingness and responsiveness scores for studies which used the 19-item CFSQ ($M_{demand} = 2.85$, $SD = 0.16$; $M_{response} = 1.20$, $SD = 0.08$) or a variation of the CFSQ ($M_{demand} = 2.73$, $SD = 0.32$; $M_{response} = 1.22$, $SD = 0.22$), though the variation was wider around those using an altered version of the CFSQ. Results from independent samples *t*-tests comparing the groups were not significant, suggesting the originally proposed cut-off values did not differ statistically from an expanded summary of studies using the CFSQ.

Table 3
Comparison of demandingness and responsiveness for studies which use the 19-item CFSQ or a variation compared to Hughes' recommended cutoff scores.

		k	*n*	*M*	*SD*
Demandingness	Studies that used only the 19-item CFSQ	9	2147	2.86	0.18
	Studies that used a variation of the 19-item CFSQ	7	2005	2.59	0.39
	(Hughes et al., 2012)	5	1359	2.82	0.14
Responsiveness	Studies that used only the 19-item CFSQ	9	2147	1.18	0.07
	Studies that used a variation of the 19-item CFSQ	7	2005	1.26	0.30
	(Hughes et al., 2012)	5	1359	1.16	0.03

Note. Results from independent samples t-tests comparing the 19-item CFSQ and variation to Hughes' recommended cut-off scores were not significant.

3.2. BMI-Z and responsiveness, demandingness and parent feeding style

Table 4 presents bivariate associations between responsiveness, demandingness, and BMI z-scores as well as mean-level differences between BMI z-score and parent feeding style ($k = 8$). The correlation between BMI z-score and demandingness ($r = -0.140$; 95 % CI [−0.191--0.088]) reflected a small and negative relationship, similar in magnitude, but opposite in direction to the correlation between BMI z-score and responsiveness ($r = 0.116$; 95 % CI [0.076–0.155]). Mean-level differences between parent feeding style categories and child BMI were greater for indulgent ($M = 0.980$, $SE = 0.094$) and uninvolved parents ($M = 0.872$, $SE = 0.072$) compared to authoritative ($M = 0.675$, $SE = 0.057$) and authoritarian parents ($M = 0.612$, $SE = 0.075$). Average BMI z-scores for children of indulgent parents approached one standard deviation from the mean and near the 85th percentile which reflects the cutoff for being defined as overweight by the CDC.

Whether there was a meaningful difference between the BMI z-score means for pairs of parent feeding styles was calculated using Cohen's *d* (see Table 5; $k = 8$). The mean BMI z-scores were most similar between the authoritative and authoritarian feeding styles, while the 95 % confidence interval around the effect size of the BMI z-score mean differences for the other parent feeding style pairs did not include zero and demonstrated meaningful differences between child weight-status and these caregiver's feeding styles. The Classic-Fail Safe test suggested that these results were not likely to be altered by publication bias when

Table 4
BMI z-scores for demandingness, responsiveness, and parent feeding style using a random effects approach (k = 8).

	I^2	*r*			95 % CI LL-UP	How many studies crossed 0
Demandingness	37.3	−0.140	–	–	−0.191–0.088	3
Responsiveness	0	0.116	–	–	0.076–0.155	2

		M	*SE*	Variance/*SD*	95 % CI LL-UP	How many studies crossed 0
Authoritative	0	0.675	0.057	0.003/0.055	0.563–0.787	1
Authoritarian	72.1	0.612	0.075	0.006/0.077	0.465/0.758	0
Indulgent	79.0	0.980	0.094	0.009/0.095	0.795–1.164	1
Uninvolved	29.9	0.872	0.072	0.005/0.071	0.731/1.013	1

Table 5
Effect size measured by Cohen's d with 95 % confidence interval for BMI z-score mean differences between parent feeding styles categories (k = 8).

	Authoritarian (*n* = 807)	Indulgent (*n* = 782)	Uninvolved *d* (*n* = 392)
Authoritative (*n* = 397)	*d* = 0.94 (−0.14–1.92)	*d* = 3.93 (2.10–5.33)	*d* = 3.10 (1.25–4.34)
Authoritarian (*n* = 807)	–	*d* = 4.26 (2.32–5.73)	*d* = 3.51 (1.18–4.83)
Indulgent (*n* = 782)	–	–	*d* = 1.29 (0.14–2.28)

considering the number of studies needed to be included to bring the *p*-value to a non-significant level (Demandingness = 51 studies; Responsiveness = 83 studies; authoritative = 267 studies; authoritarian = 484 studies; indulgent = 1044 studies; uninvolved = 424 studies).

4. Discussion

The current study confirmed the existing cutoff scores established for the CFSQ were generalizable to the average median scores for demandingness and responsiveness across 19 studies. The range across the studies (demandingness: 1.23–3.05; responsiveness: 0.85–2.31) suggests heterogeneity does exist broadly, but the established cutoff scores can serve as a guide for researchers when evaluating their data and examining how their population sample differs from the average sample of low-income families in America.

While the cut-off scores remained similar, it is important to consider that some parents may be classified as one feeding style among one sample but could be considered engaging more generally in a different feeding style if included with a different sample. Researchers should continue to examine whether the cutoff values are appropriate for their population, as these median splits are not likely to generalize to all (Hughes et al., 2012; Kiang & Ip, 2018; Ip et al., 2018). No authors examined in the review used the cut-off values and instead opted for utilizing their own sample's median splits, suggesting this recommendation in the original manuscript to be aware of heterogeneity among populations is being implemented. In this manner, the person-centered approach of utilizing the median cutoff scores to categorize families as authoritative, authoritarian, indulgent, and uninvolved has been recommended for applied and clinical purposes while the continuous score is recommended as a variable-centered approach for statistical modeling (Power et al., 2019; Tovar et al., 2015).

While extensive research has examined the relationship between parent feeding style categories and child BMI, inconsistency in the literature necessitated a synthesis of these studies to examine more consistent patterns. The large effect size differences between the majority of the caregivers' feeding styles provide evidence for differential associations between CFSQ parent feeding style categories and child weight status. The indulgent and uninvolved categories demonstrated the greatest risk for children's BMI, with the greatest contrast between these two categories and authoritative and authoritarian feeding styles. The largest effect sizes for BMI z-scores mean differences between parent feeding styles were between indulgent and authoritarian ($d = 4.26$) and authoritative ($d = 3.93$) parents.

The relation between child weight-status for children of authoritative and authoritarian parents was not significantly different, providing support for what has been reported in existing studies that these two categories for classifying caregiver's approaches to feeding are related to the lowest weight-status (see Hughes et al., 2005, 2008, 2016; Tovar et al., 2012; Vollmer, Mobley, 2013a). Consistent with this finding, demandingness was negatively associated with child weight status as well. These findings are inconsistent with studies of *general* parenting style showing that authoritative parenting is negatively associated with childhood obesity whereas authoritarian parenting shows a positive association (Vollmer, Mobley, 2013b).

It is not clear why the relationship between authoritarian parenting and childhood weight status differs for studies of general parenting compared to studies of feeding styles. One possibility is that in the feeding domain, the direction of effects is from child to parent. That is, parents of underweight children may adopt a highly controlling authoritarian feeding style because they exercise high levels of control in trying to encourage their food avoidant child to eat. Studies of feeding *practices* typically show that pressure to eat is negatively associated with child BMI (Shloim et al., 2015). Alternatively, authoritarian feeding may somehow be protective against childhood obesity in low-income populations. Studies of general parenting in low-income populations sometimes find that authoritarian parenting is associated with positive child outcomes (Halgunseth, 2019; Landsford et al., 2004; LeCuyer et al., 2011) suggesting that authoritarian parenting in these populations may reflect high levels of parental involvement and structure that may promote healthy child outcomes. In the case of feeding styles, authoritarian parents may provide more control over children's consumption of less healthy foods that contribute to childhood obesity. Future studies examining the direction of effects would provide further insights into the present findings.

It is important to note that while authoritative and authoritarian feeding styles provided reduced risk for mean BMI z-scores, all BMI z-score averages were above 0. This indicates that low-income children are at greater risk for higher weight status as compared to a population of children including a range of incomes and supports the necessity for targeting families in poverty (Shriver et al., 2019; Worobey & Trytko, 2014). Though the feeding style that parents typically engage in may benefit from different prevention and intervention strategies.

The current study was an extensive review and meta-analysis of the literature between 2012 and 2020 but should be considered with the following limitations. Publication bias is an important aspect to consider in meta-analysis. While the search strategy for this study was comprehensive and diligent it is inevitable that some relevant studies may have been missed, resulting in a biased sample. In addition, studies presenting

significant, large effects are more likely to be published and therefore, effects reported in unpublished articles are missing from this analysis. It is unlikely, however, that publication bias would change the results of the current meta-analysis when examined using the Classic Fail-Safe Test. The meta-analysis will be repeated when more articles with the CFSQ and child BMI z-score are available, as the low-sample size could influence the results and the accuracy of the tests of heterogeneity (Higgins et al., 2003; von Hippel, 2015). To adjust for the lower sample size of the meta-analysis, a confidence interval was provided with the I^2 statistic, as recommended by meta-analysis methodologists (see von Hippel, 2015). This article includes a large majority of low-income families. Low-income status may be defined in unique ways by different researchers, and therefore not all families in this analysis may be classified using the same income levels. In addition, one study did not explicitly define their sample as low-income. This study was included in the review portion of this paper (see Fisher et al., 2013), but was not included in the meta-analysis portion. Another limitation to consider is that not all data presented in this paper was readily available in author manuscripts. As such, authors were contacted directly to gather necessary data to run analyses, but not all information could be confirmed. Finally, due to the number of studies included in this meta-analysis, it was not possible to examine group differences by demographic factors such as child age, gender, race and ethnicity. This is a critically important area of research and should be examined explicitly in future studies.

5. Conclusion

Very few authors have quantitatively examined the relation between feeding practices and child weight status in a meta-analysis (Ruzicka et al., 2021). To the authors' knowledge, no study has examined the relationship between BMI and feeding styles in a meta-analysis, using exclusively the CFSQ. A report of this kind is essential due to the wide use of the CFSQ in low-income samples and the imminent concern of childhood obesity, especially in low-income, racial and ethnic minority groups (Dunn et al., 2020; Hughes et al., 2012; Sharma et al., 2020). The synthesis of relevant literature and statistical examination of BMI in relation to parent feeding style and responsiveness and demandingness will allow researchers to draw more clear conclusions regarding parent-child feeding relationships and develop targeted interventions for at-risk groups.

Role of funding sources

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Credit authorship contribution statement

BAL and JSN were integrated into all aspects of the analyses and writing of the manuscript. RNG and HRJ were active in data collection, table development, and manuscript formatting. TGP and SOH were involved in the development of the measure and the current study aims and were integral to synthesizing results with the broader literature. All authors read and approved the final manuscript.

Declaration of competing interest

The authors declare that they have no competing interests.

Acknowledgments

We would like to acknowledge undergraduate research assistants at the University of North Florida who assisted in the coding and literature review portion of this study. We would also like to thank the time spent by authors we corresponded with who assisted us in the review and meta-analysis by answering questions and providing information from their studies that utilized the CFSQ.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.eatbeh.2022.101659.

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