



Child eating behaviors in primary education beneficiaries

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Abstract

Objective: To determine child eating behaviors in primary education beneficiaries.

Material and Methods: A cross-sectional, observational, prospective, and analytical study was conducted among 129 students and their primary caregivers at the "Nicolás Bravo" primary school in Orizaba, Veracruz. The Children's Eating Behaviour Questionnaire (CEBQ; $\alpha=0.88$) and the Adult Eating Behaviour Questionnaire (AEBQ; $\alpha=0.77-0.91$) were applied to mothers, tutors, or primary caregivers. Statistical analysis included descriptive frequencies and percentages, Chi-square (χ^2) tests for association between questionnaire subscales and anthropometric variables (child BMI-Z and caregiver BMI), the Kruskal-Wallis H test to compare eating behavior scores across BMI-Z categories, and Spearman correlations (ρ) to evaluate the relationship between homologous subscales of both instruments. The project was carried out during the 2025–2026 period.

Results: A sample of 103 dyads (child-caregiver) was analyzed. The prevalence of excess weight (overweight/obesity) was 42.7% in schoolchildren and 61.1% in caregivers. In the general CEBQ distribution, medium-intensity eating behavior predominated. Association analysis (χ^2) and median comparisons (Kruskal-Wallis H) revealed that child BMI-Z is significantly associated with satiety responsiveness ($p=0.022$), enjoyment of food ($p=0.009$), and food fussiness ($p=0.010$). Spearman correlations (ρ) showed strong intergenerational convergence, particularly in emotional overeating ($\rho=0.635$, $p<0.01$).

Conclusions: The alternative hypothesis is rejected, as food approach traits (Proingesta) did not exceed 50% at high levels; instead, an intermediate self-regulation profile predominated.

Keywords: Eating behavior, appetite traits, childhood, beneficiary

Introduction

Child eating behavior is a complex process determined by the interaction of biological and environmental factors, where the family environment is the primary shaper of early habits [1, 2]. Nevertheless, the increase in childhood overweight and obesity has become a global challenge. The WHO estimates more than 340 million minors with excess weight, while in Mexico, the prevalence among schoolchildren exceeds 30%, raising the risk of long-term metabolic and psychological complications [3, 4].

Under the Behavioral Susceptibility Theory, it is postulated that Body Mass Index (BMI) is mediated by specific traits: food-approach (enjoyment of food) and food-avoidance (satiety and slowness in eating). These behaviors, evaluated through the Children's Eating Behaviour Questionnaire (CEBQ), are influenced by the practices of caregivers, who act as architects of the food environment and models of regulation [5, 6, 7].

Despite its relevance, the identification of public health risks is often limited to anthropometric indicators, ignoring the behavioral mediators that precede weight gain. In the context of the IMSS in Orizaba, Veracruz, it is a priority to study this interaction to support preventive strategies based on family self-regulation [8, 9, 10]. Therefore, the present study seeks to determine the relationship between child intake behavior, caregiver behavior, and nutritional status in schoolchildren of that region.

Material and Methods

The study was approved by the Health Research and Ethics Committee (R-2025-3101-018) and conducted at the "Nicolás Bravo" Primary School in Orizaba, Veracruz, Mexico. The sample consisted of 129 primary caregivers (responsible for feeding ≥ 5 days/week), ensuring a 95% confidence level and a 3% margin of error. After obtaining informed consent, the Children's Eating Behaviour Questionnaire [11] (CEBQ) $\alpha=0.88$ and the Adult Eating Behaviour Questionnaire [2] (AEBQ); $\alpha= >0.77$ were administered in person. These instruments evaluate food-approach and food-avoidance dimensions using 5-point Likert scales.

Anthropometric measurements of weight (100g precision, with a 350g adjustment for clothing) and height (0.1mm precision) were performed [5]. Child nutritional status was determined through BMI Z-scores using the WHO Anthro Plus software, following WHO criteria to classify obesity, overweight, normal weight, and malnutrition. Regarding ethical aspects, in accordance with the regulations of the General Health Law on research matters, this protocol prioritized respect for dignity and the protection of rights and well-being. Based on the Nuremberg Principles, voluntary informed consent and assent were signed; the study aimed for beneficial results for the individual, family, and society while allowing participants to withdraw at any time.

Statistical analysis was performed using IBM SPSS v.25.0. Due to the non-normal distribution of the data (Kolmogorov–Smirnov, $p < 0.05$), non-parametric tests were employed. Chi-square (χ^2) was used to associate sociodemographic variables with eating behavior levels (low, medium, high). The Kruskal–Wallis H test was used to compare CEBQ dimensions according to nutritional status, and Spearman’s Rho was used to correlate the behaviors of caregivers and children. Significance was set at $p < 0.05$.

Results

The present study aimed to identify child eating behaviors in primary education beneficiaries in the city of Orizaba, Veracruz. Initially, 135 children were enrolled, of whom 103 met the inclusion criteria and were analyzed. The Children's Eating Behaviour Questionnaire (CEBQ) was administered to all participants, and the Adult Eating Behaviour Questionnaire (AEBQ) was applied to their caregivers. Additionally, sociodemographic, family, and anthropometric variables were recorded according to the established objectives. The general characteristics of the analyzed sample are described below. Regarding sex distribution, a slight predominance of females was observed at 53.4% ($n = 55$), compared to 46.6% males ($n = 48$). In terms of age composition, the majority of the population was concentrated in the 5 to 9-year-old range, representing 72.8% ($n = 75$) of the sample, while the remaining 27.2% ($n = 28$) fell into the 10 to 12-year-old group. Regarding grade level, a higher participation of fourth-grade students was identified at 29.1% ($n = 30$), followed by first grade at 15.5% ($n = 16$) and second grade at 14.6% ($n = 15$). Finally, the analysis of birth order revealed that 42.7% ($n = 44$) of the participants were second-born, followed by only children, who represented 17.5% ($n = 18$) of the evaluated sample.

When evaluating the nutritional status of the children, 53.4% ($n = 55$) were found to have a normal weight. However, the combined prevalence of excess weight (overweight and obesity) reached 42.7%, broken down into 19.4% ($n = 20$) with overweight and 23.3% ($n = 24$) with obesity. Only 3.9% ($n = 4$) of the minors presented with malnutrition. On the other hand, the nutritional profile of the caregivers showed a greater tendency toward excess weight,

affecting 61.1% of cases (38.8% overweight and 22.3% with some degree of obesity). Only 38.8% ($n = 40$) of the caregivers were classified within the normal weight range.

To analyze the relationship between child eating behaviors and the nutritional status of the participants, the association between the CEBQ subscales and the standardized body mass index (BMI-Z) categorized into underweight, normal weight, overweight, and obesity was evaluated. In the Food Responsiveness subscale, a significant association with nutritional status according to BMI-Z was observed ($\chi^2 = 18.137$, $p = 0.006$), increasing proportionally as BMI increases. In the underweight group, exclusively low levels of FR were observed in 4 cases (100%). In children with a normal BMI, a low level of FR predominated in 40 cases (72.7%), followed by medium levels in 9 cases (16.4%) and high levels in 6 cases (10.9%). In the overweight group, the majority were concentrated at the low level with 12 cases (60.0%) and medium level with 8 cases (40.0%), with no cases at the high level. In children with obesity, the medium level was the most frequent in 13 cases (54.2%), followed by the low level with 8 cases (33.3%) and the high level in 3 cases (12.5%). Likewise, a significant association was identified in the Satiety Responsiveness subscale ($\chi^2 = 20.778$, $p = 0.002$). In the underweight group, only two cases were recorded at the medium level (50.0%) and two cases at the high level (50.0%). In children with a normal BMI, the majority presented a medium level of SR in 34 cases (61.8%), followed by a low level with 19 cases (34.5%) and a high level with 2 cases (3.6%). In the overweight group, the medium level of SR predominated with 11 cases (55.0%) and the low level with 9 cases (45.0%), with no cases at the high level. In children with obesity, a more heterogeneous distribution was observed, with a predominance of the medium level in 12 cases (50.0%), followed by the low level in 11 cases (45.8%) and only one case at the high level (4.2%), suggesting a lower capacity for internal self-regulation in this last group. The other subscales did not show a statistically significant association with BMI-Z: Emotional Overeating ($p = 0.615$), Enjoyment of Food ($p = 0.078$), Desire to Drink ($p = 0.374$), Emotional Undereating ($p = 0.410$), Slowness in Eating ($p = 0.687$), Food Fussiness ($p = 0.064$), Global Food-Approach ($p = 0.217$), and Global Food-Avoidance ($p = 0.090$). (See Table 1).

Table 1: Association between CEBQ dimensions and the child's categorical BMI-Z

Subscale (CEBQ)	Level	Underweight n(%)	Normal n(%)	Overweight n(%)	Obesity n(%)	Total	p
Food Responsiveness	Low	4 (100.0%)	40 (72.7%)	12 (60.0%)	8 (33.3%)	64	0.006
	Medium	0 (0.0%)	9 (16.4%)	8 (40.0%)	13 (54.2%)	30	
	High	0 (0.0%)	6 (10.9%)	0 (0.0%)	3 (12.5%)	9	
Total		4	55	20	24	103	
Emotional Overeating	Low	3 (75.0%)	44 (80.0%)	13 (65.0%)	15 (62.5%)	75	0.615
	Medium	1 (25.0%)	10 (18.2%)	7 (35.0%)	8 (33.3%)	26	
	High	0 (0.0%)	1 (1.8%)	0 (0.0%)	1 (4.2%)	2	
Total		4	55	20	24	103	
Enjoyment of Food	Low	1 (25.0%)	5 (9.1%)	0 (0.0%)	0 (0.0%)	6	0.078
	Medium	3 (75.0%)	31 (56.4%)	9 (45.0%)	17 (70.8%)	60	
	High	0 (0.0%)	19 (34.5%)	11 (55.0%)	7 (29.2%)	37	
Total		4	55	20	24	103	
Desire to Drink	Low	3 (75.0%)	28 (50.9%)	12 (60.0%)	7 (29.2%)	50	0.374
	Medium	1 (25.0%)	25 (45.5%)	8 (40.0%)	16 (66.7%)	50	
	High	0 (0.0%)	2 (3.6%)	0 (0.0%)	1 (4.2%)	3	
Total		4	55	20	24	103	
Satiety Responsiveness	Low	0 (0.0%)	19 (34.5%)	9 (45.0%)	11 (45.8%)	39	0.002
	Medium	2 (50.0%)	34 (61.8%)	11 (55.0%)	12 (50.0%)	59	

	High	2 (50.0%)	2 (3.6%)	0 (0.0%)	1 (4.2%)	5	
Total		4	55	20	24	103	
Emotional Undereating	Low	0 (0.0%)	25 (45.5%)	12 (60.0%)	10 (41.7%)	47	0.410
	Medium	4 (100.0%)	28 (50.9%)	8 (40.0%)	13 (54.2%)	53	
	High	0 (0.0%)	2 (3.6%)	0 (0.0%)	1 (4.2%)	3	
Total		4	55	20	24	103	
Slowness in Eating	Low	0 (0.0%)	22 (40.0%)	8 (40.0%)	11 (45.8%)	41	0.687
	Medium	4 (100.0%)	32 (58.2%)	12 (60.0%)	13 (54.32)	61	
	High	0 (0.0%)	1 (1.8%)	0 (0.0%)	0 (0.0%)	1	
Total		4	55	20	24	103	
Food Fussiness	Low	0 (0.0%)	23 (41.8%)	15 (75.0%)	13 (54.2%)	51	0.064
	Medium	4 (100.0%)	28 (50.9%)	4 (20.0%)	10 (41.7%)	46	
	High	0 (0.0%)	4 (7.3%)	1 (5.0%)	1 (4.2%)	6	
Total		4	55	20	24	103	
Global Food-Approach	Low	3 (75.0%)	26 (47.3%)	9 (45.0%)	5 (20.8%)	43	0.217
	Medium	1 (25.0%)	27 (49.1%)	11 (55.0%)	17 (70.8%)	56	
	High	0 (0.0%)	2 (3.6%)	0 (0.0%)	1 (8.3%)	4	
Total		4	55	20	24	103	
Global Food-Avoidance	Low	0 (0.0%)	22 (40.0%)	14 (70.0%)	8 (33.3%)	44	0.090
	Medium	4 (100.0%)	32 (58.2%)	6 (30.0%)	16 (66.7%)	58	
	High	0 (0.0%)	1 (1.8%)	0 (0.0%)	0 (0.0%)	1	
Total		4	55	20	24	103	

Source: Authors.

Statistically significant associations were observed between the CEBQ subscales and the child's categorical BMI-Z in the Food Responsiveness subscale ($\chi^2= 18.137, p = 0.006$) and the Satiety Responsiveness subscale ($\chi^2 = 20.778, p = 0.002$).

In order to identify the distribution of children's eating behaviors according to the global dimensions of the CEBQ, a classification based on theoretical score ranges was performed. A predominance of the medium level was observed in most subscales: Enjoyment of Food (58.3%), Satiety Responsiveness (57.3%), Emotional Undereating (51.5%), and Slowness in Eating (59.2%), reflecting an intermediate food regulation profile. The global dimensions

of Food-Approach (54.4%) and Food-Avoidance (56.3%) confirm this general trend toward balanced eating behavior, without a marked predominance toward overeating or avoidance. Interestingly, Emotional Overeating (72.8%) and Food Responsiveness (62.1%) had their highest concentrations at the low level, indicating that, at baseline, the sample does not tend toward overeating due to external or emotional stimuli. (See Table 2).

Table 2: Classification of eating behaviors into food-approach and food-avoidance dimensions

Subscale (CEBQ)	Low n (%)	Medium n (%)	High n (%)	Mode
Food Responsiveness	64 (62.1%)	30 (29.1%)	9 (8.7%)	1
Emotional Overeating	75 (72.8%)	26 (25.2%)	2 (1.9%)	1
Enjoyment of Food	6 (5.8%)	60 (58.3%)	37 (35.9%)	2
Desire to Drink	50 (48.5%)	50 (48.5%)	3 (2.9%)	1–2
Satiety Responsiveness	39 (37.9%)	59 (57.3%)	5 (4.9%)	2
Emotional Undereating	47 (45.6%)	53 (51.5%)	3 (2.9%)	2
Slowness in Eating	41 (39.8%)	61 (59.2%)	1 (1.0%)	2
Food Fussiness	51 (49.5%)	46 (44.7%)	6 (5.8%)	1
Global Food-Approach	43 (41.7%)	56 (54.4%)	4 (3.9%)	2
Global Food-Avoidance	44 (42.7%)	58 (56.3%)	1 (1.0%)	2

Source: Authors.

A predominance of the medium level was observed in most subscales: Enjoyment of Food (58.3%), Satiety Responsiveness (57.3%), Emotional Undereating (51.5%), and Slowness in Eating (59.2%).

In order to fulfill the third objective of the study, the relationship between eating behaviors (CEBQ dimensions and subscales) and the child's nutritional status determined by categorical BMI-Z according to WHO criteria was analyzed. Since the CEBQ subscale scores did not show a normal distribution, the Kruskal-Wallis H test was applied, which allows for a more sensitive comparison of medians across multiple independent groups. Statistically significant associations were observed between BMI-Z categories and the following subscales: Food Responsiveness ($p = 0.047$), Enjoyment of Food ($p = 0.009$), Satiety Responsiveness ($p = 0.022$), Emotional Undereating ($p = 0.020$), Slowness in Eating ($p = 0.028$), and Food Fussiness ($p = 0.010$).

Significant associations were also found with the global dimensions of Food-Approach ($p = .034$) and Food-Avoidance ($p = .004$). No statistically significant associations ($p > .05$) were observed for the Emotional Overeating and Desire to Drink subscales. These findings suggest that the pattern of eating behaviors is related to the child's nutritional status, with differences being more pronounced in Food-Avoidance (anti-intake) behaviors, particularly those linked to satiety and food fussiness. These results reinforce the hypothesis that weight excess or deficit is not only linked to a greater interest in food (Food-Approach) but primarily to alterations in avoidance and satiety mechanisms. (See Table 3).

Table 3: Association between CEBQ subscales and dimensions with the child's categorical BMI-Z (malnutrition, normal weight, overweight, and obesity) (Kruskal-Wallis H test)

Dimension	Subscale (CEBQ)	H de Kruskal–Wallis	gl	p
Food-Approach	Food Responsiveness	7.954	3	0.047
	Emotional Overeating	2.111	3	0.550
	Enjoyment of Food	11.674	3	0.009
	Desire to Drink	6.869	3	0.076
Food-Avoidance	Satiety Responsiveness	9.627	3	0.022
	Emotional Undereating	9.793	3	0.020
	Slowness in Eating	9.068	3	0.028
	Food Fussiness	11.256	3	0.010
Global dimensions	Food-Approach	8.658	3	0.034
	Food-Avoidance	13.416	3	0.004

Source: Authors.

Statistically significant associations were observed between BMI-Z categories and the following subscales: Food Responsiveness (p = 0.047), Enjoyment of Food (p = 0.009), Satiety Responsiveness (p = 0.022), Emotional Undereating (p = 0.020), Slowness in Eating (p = 0.028), and Food Fussiness (p = 0.010), as well as with the global dimensions of Food-Approach (p = 0.034) and Food-Avoidance (p = 0.004)

In order to compare the eating behaviors of caregivers with those of their children, a correlation analysis was performed using Spearman’s coefficient between the homologous subscales of the AEBQ and the CEBQ. Both scales evaluate equivalent dimensions of eating behavior, classified into food-approach and food-avoidance domains. Positive and statistically significant correlations were observed between the homologous dimensions of both instruments. Notably, a positive correlation was found between Emotional Overeating in both questionnaires (rho=.635, p < .01), suggesting high consistency in the measurement of this trait. Likewise, a significant relationship was observed between Enjoyment of Food in both questionnaires (rho=.379, p < .01). Regarding food-avoidance behaviors, Food Fussiness showed a significant correlation between both (rho =.252, p

=.010). A positive correlation was also found between Satiety Responsiveness in the AEBQ and the CEBQ (rho =.217, p < .027), as well as with Emotional Undereating (rho =.337, p < .01). On the other hand, relevant negative correlations were identified: Enjoyment of Food (AEBQ) was inversely associated with Satiety Responsiveness (rho =-.359, p < .01) and with Food Fussiness (rho =-.235, p < .05) in the CEBQ. These findings indicate that individuals with greater hedonic enjoyment of food tend to present a lower capacity to respond to internal satiety cues. Finally, the Slowness in Eating dimension did not show significant associations with most of the CEBQ subscales, suggesting that this rhythmic trait is independent of other eating behaviors in this particular sample. (See Table 5).

Table 4: Correlations between homologous subscales of the CEBQ and AEBQ

AEBQ\CEBQ	EO	FR	EF	SR	EU	SE	FF
Food Responsiveness (EO)	.270** (.006)	.250* (.011)	.031 (.755)	-.190 (.054)	.065 (.514)	-.151 (.128)	.025 (.804)
Emotional Overeating (FR)	.302** (.002)	.635** (.000)	-.009 (.932)	-.135 (.174)	.261** (.008)	-.154 (.120)	.293** (.003)
Enjoyment of Food (EF)	.342** (.000)	.061 (.542)	.379** (.000)	-.359** (.000)	-.245** (.013)	-.169 (.088)	-.235* (.017)
Satiety Responsiveness (SR)	.207* (.036)	.163 (.099)	-.264** (.007)	.217* (.027)	.337** (.000)	.180 (.068)	.303** (.002)
Emotional Undereating (EU)	.291** (.003)	.215* (.029)	.039 (.692)	-.033 (.741)	.147 (.138)	.016 (.874)	.194 (.050)
Slowness in Eating (SE)	-.087 (.382)	-.184 (.063)	.001 (.995)	.151 (.129)	.143 (.150)	.101 (.311)	.148 (.135)
Food Fussiness (FF)	.022 (.827)	.110 (.270)	-.256** (.009)	.263** (.007)	.191 (.053)	.079 (.425)	.252* (.010)

Source: Authors.

Notes: The diagonal values (in bold) represent the correlations between homologous subscales (AEBQ–CEBQ).

Values off the diagonal represent cross-associations between different eating behaviors.

The p-value is indicated in parentheses. *. Correlation is significant at the 0.05 level (2-tailed). **. Correlation is significant at the 0.01 level (2-tailed).

Discussion

The objective of this study was to identify child eating behaviors in primary education beneficiaries in Orizaba, Veracruz. The 2022 National Health and Nutrition Survey (ENSANUT 2022), conducted in Mexico with a representative sample of 15,109 schoolchildren, evaluated the prevalence of excess weight and reported a value of 37.3%. Similarly, this work, involving 103 participants, determined that the combined proportion of overweight and obesity was present in 44 schoolchildren (42.7%) from Orizaba, confirming a local prevalence higher than the national average.

Hunot-Alexander *et al.* (2022), in Guadalajara, Mexico, through research with 842 mother-child dyads (children aged 3 to 13) titled "Intergenerational transmission of appetite: Associations between mother-child dyads in a

Mexican population," examined the correlation between appetite traits and BMI-Z, finding a significant association between Enjoyment of Food and BMI Z-score (r = 0.20, p < 0.01). In the present study, the Enjoyment of Food (EF) variable shows a statistically significant association with the child's BMI-Z (p = 0.009), validating that hedonic pleasure from eating is a key driver of weight gain in Mexican childhood. Furthermore, regarding the intergenerational correlation of Emotional Overeating, the author found a coefficient of r = 0.30 (p < 0.001). This study yielded an extraordinarily high Spearman correlation of rho = 0.635 (p < 0.01) between the caregiver and the child, suggesting that the use of food as an emotional regulator is a dominant family trait in Veracruz.

Fisher *et al.* (2022), in Michigan, USA, through the analysis of 1,004 children aged 3 to 4 years linked to the Head Start

program, titled "Characteristics of eating behavior profiles among preschoolers with low-income backgrounds: a person-centered analysis," evaluated child appetite profiles and identified a "moderate eating" profile in 43.2% of cases, characterized by intermediate levels of regulation. In this study, it was determined that total Food-Approach was significantly associated with BMI-Z ($p = 0.034$), finding that 54.4% of the sample fell into an intermediate regulation level, coinciding with the moderate predominance trend reported internationally.

Derks *et al.* (2018), in Rotterdam, Netherlands, through the "Generation R" population-based cohort study of 3,331 children, titled "Eating behavior and body composition across childhood: a prospective cohort study," investigated Satiety Responsiveness in early stages, demonstrating a prospective inverse association with BMI-Z ($\beta = -0.10$, $p < 0.01$). This study indicated that the child's Satiety Responsiveness (SR) variable is significantly associated with their nutritional status ($p = 0.022$), confirming that children with higher weight present a marked failure in their biological control mechanisms.

One of the main strengths of this work is the use of homologous instruments (AEBQ and CEBQ), which allowed for a bidirectional and comparative evaluation of eating behavior in the caregiver-child dyad. Additionally, the use of robust non-parametric tests, such as the Kruskal-Wallis H test, allowed for the identification of fine associations between behavior medians and nutritional status that are not always visible in simple categorical analyses. However, the cross-sectional design of the study prevents establishing causal relationships, and the sample size in certain age groups or family types limits the generalizability of these specific findings. Based on these results, it is recommended for future research to conduct longitudinal studies to observe the evolution of Food Fussiness as children transition into late adolescence.

Conclusion

According to the findings, the alternative hypothesis is rejected and the null hypothesis is accepted, as Food-Approach levels did not exceed 50% at high levels. An intermediate regulation profile predominates (54.4%), with only 5.8% showing high scores. However, Food-Approach is significantly associated with the nutritional status of the dyad, confirming that child eating behavior is modulated by the family environment.

In general, a balanced regulation prevails. Nonetheless, children with excess weight or caregivers with obesity show a greater inclination toward Enjoyment of Food and Food Responsiveness. The high intergenerational correlation suggests that the caregiver's model is the primary risk factor for a shift toward higher levels of food attraction.

A critical prevalence of excess weight (42.7% of schoolchildren; 61.1% of caregivers) was identified in Orizaba. Children with higher weight exhibit failures in satiety and slowness mechanisms, validating the Behavioral Susceptibility Theory. Emotional Overeating was the most shared trait ($\rho = 0.635$), proving that emotional regulation through food is a learned behavior in the home. Additionally, fussiness decreases with age, and composite families influence emotional undereating.

It is recommended to implement nutritional programs that integrate emotional management and the recognition of satiety cues with mandatory caregiver participation. It is fundamental to promote repeated exposure to healthy foods

in early stages and to treat adult behavior as a central pillar for the prevention of childhood obesity.

Authors' Contributions

MSPG: Study planning, database review, and manuscript editing.

BEAA: Study planning, data collection, interpretation of results, and initial drafting of the manuscript.

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