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Enhancing food habits via sensitivity in rural low-SES mothers of children aged 1–3 living in Colombia: a randomized controlled trial using video-feedback intervention

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ABSTRACT

In a randomized controlled trial with 25 Colombian rural low-SES mothers and their children (aged 1–3 years), the effectiveness of the Video-feedback Intervention to promote Positive Parenting and Sensitive Discipline (VIPP-SD) in enhancing maternal sensitivity and food habits was tested pre-intervention, post-intervention, and at a 6-month follow-up. The study further verified whether maternal sensitivity represented a mechanism of change for food habits. Mixed models indicated that the VIPP-SD did promote higher maternal sensitivity and better food habits. Moreover, increased maternal sensitivity following the VIPP-SD predicted improved maternal food habits, both post-intervention and at the follow-up. The findings suggest that interventions aimed at preventing early inadequate parental food habits in low-SES communities should promote sensitive parenting during daily mother–child interactions, in addition to offering nutritional advice.

Introduction

Feeding is a life-sustaining function that is critical for growth and survival. Early nutritional problems have been shown to undermine children's health and well-being (Black et al., 2008), and for this reason they may be considered a form of familial neglect (Block & Krebs, 2005). Inadequate parental food habits (i.e., parents' attitudes towards, practice of, and knowledge of feeding their child) constitute a significant risk factor for inadequate child nutrition, in terms of both nutritional deficits and nutritional excesses (Morawska et al., 2014). Between the ages of 6–24 months, children usually progress from exclusively breastfeeding to consuming solid foods and other liquids (i.e., *complementary feeding*). During this phase, they are particularly vulnerable to malnutrition, which partially explains the high prevalence of malnutrition in children under the age of 5 years (Dewey, 2001). Evidence shows that improper parental food habits with children as young as 1–3 years may lead them to consume food that is overly energy-dense, with insufficient fruit and

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vegetables (Denney et al., 2017; Emmett & Jones, 2015; Fox et al., 2004; Goldbohm et al., 2016; Ocké et al., 2008).

Colombia, similar to other Latin American countries, is currently experiencing a food transition (i.e., food consumption changes across the population) characterized by a growing number of overweight individuals and a double nutritional burden of under/overnutrition (Parra et al., 2015). As a result, approximately 40% of the Colombian population are currently affected by issues of food security and nutrition (ENSIN, 2018). Across Colombia, there is considerable cross-territorial variation in the prevalence of these issues, reflecting disparities in income per capita (OECD, 2012). In general, the country's rural areas present more severe problems and greater income inequality (ENSIN, 2018): 57.5% of rural households are affected by food insecurity and 17% of rural children display growth delays as a result of nutritional deficiencies; in contrast, 38.4% of urban households are affected by food insecurity and 11.6% of urban children suffer from growth delays (OECD/FAO/UNCDF, 2016). In Boyacá – the Colombian base of the present study – 16.7% of children under the age of 5 years suffer from chronic malnutrition and 52.8% of all children and adults are overweight (ENSIN, 2018). In addition, in Colombia, one out of four children between the ages of 6–59 months and three out of eight women of reproductive age (13–49 years) in the subregions of Boyacá, Cundinamarca, and Meta suffer from anemia (ENSIN, 2018), which represents a high-risk health condition for this population.

The family is the most proximal context influencing nutrition in early childhood (Harrison et al., 2011). In this developmental period, malnutrition might be caused by not only a lack of access to sufficient food or a lack of food variety and quality (especially with respect to the bioavailability of micronutrients), but also by parents, themselves, who may not make the best use of the available resources due to cultural beliefs and practices, a lack of knowledge, and/or inappropriate advice (Allen & Gillespie, 2001; World Health Organization, 1998). Given that young children depend on their parents for nutrition, parents should be supported in learning about food and improving their food habits, as these are likely to determine whether their children develop malnutrition and/or obesity.

Several environmental and theoretical aspects must be considered when determining the best interventions to enhance caregivers' food habits and, in turn, prevent child malnutrition. First, in Colombia (and specifically in Boyacá), mothers are generally the primary caregivers; these women tend to have low levels of formal education and their traditional role is to manage small-scale livestock and agriculture. Fathers, in contrast, are generally the "breadwinners," and they tend to be away from the family home for most of the day (Triana et al., 2010). It is therefore common for young children (i.e., those who do not yet attend a childcare center or primary school) to spend all day with their mother. A second environmental consideration is that educational interventions are often heavily dependent on community-based strategies; in developing countries, this is a concern, as such strategies are often limited due to a lack of political expediency and the inconsistent presence of non-government organizations (Penny et al., 2005). Third, educational interventions around food habits tend to overlook the fact that feeding represents more than a basic biological need; it also – especially during the first years of life – represents a crucial context for the development of the dyadic parent[read: mother]–child relationship and sensitive communication. This point is well described by the term "feeding relationship," which was originally coined by Chatoor (2000) to explain that feeding

represents a fundamental interactive context for the mother–child relationship, in which the child experiences the mother's intersubjective turns and (in)sensitive communication. Finally, such an approach contrasts with evidence that many infant eating problems originate from inappropriate feeding methods, which may involve the use of food for comfort, reward, or distraction; talking and playing during meals; struggles for control; dyadic conflict; maternal non-contingency; and dyadic reciprocity (Chatoor et al., 1997).

In light of these considerations, the World Health Organization (2002) and the American Academy of Pediatrics (2017) have advocated for *responsive* complementary feeding, whereby parents provide breastmilk/formula, complementary, and solid foods to their child according to a consistent routine, in response to their child's cues of hunger and satiety, as well as developmental and nutritional needs. From this perspective, in addition to the precise food parents offer their child during complementary feeding, *the way in which* they offer the food may also strongly influence the child's acceptance of the food, as well as his/her ability to self-regulate willingness and emotional availability during eating. To date, in spite of these straightforward and authoritative recommendations, few attempts have been made to address the "how" of feeding (for an exception, see Van der Veek et al., 2019) to promote positive food habits, modify unhealthy food attitudes, and increase knowledge of dietary habits in parents.

Child feeding and maternal sensitivity

From the perspective of attachment theory, an important aspect of parenting that may have repercussions for the ways in which parents feed their children is sensitivity, which refers to a parent's ability to perceive his/her child's signals, interpret these signals correctly, and respond promptly and appropriately to them (Ainsworth et al., 1978). Although rates of sensitive responding have been found to be very similar across cultures, there is some evidence that socio-demographic factors are more salient than cultural factors in predicting sensitive parenting (Mesman et al., 2012; Mesman, van IJzendoorn, & Sagi-Schwartz, 2016; Valenzuela, 1997). Mothers with fewer years of formal education and a low socio-economic status (SES), as often found among Colombian rural mothers (Triana et al., 2010), may be less inclined to invest significant emotional and time resources into their parenting (as would typically be observed in sensitive parenting), because they are more focused on problems of survival. Such mothers may view and experience parenting as the stressful day-to-day managing of children, and be more likely to emphasize (physical) control over warmth and responsiveness (McLoyd, 1998; Pinderhughes et al., 2000). In addition to low SES, factors such as acculturation, language difficulties, and household composition are further stressors that might contribute to lower levels of sensitivity in Colombian rural mothers, making them less likely to practice positive food habits.

This represents a crucial point, insofar as Ainsworth and Russel (1972) posited that mothers who respond sensitively to their child's feeding signals tend to be contingently responsive to many other aspects of their child's behavior, such as crying, vocalizing, smiling, and physical contact. Additionally, it is worth noting what Bowlby (1969/1982) wrote: "During the early months, especially, the feeding situation constitutes a principal occasion for mother–infant interaction; it thus provides an excellent opportunity to gauge a mother's sensitivity to her baby's signals, her ability to time her interventions to suit his

rhythms, and her willingness to pay heed to his social initiatives" (p. 278). Therefore, the promotion of maternal sensitivity in relation to food habits is paramount, since, throughout the developmental stages of childhood, the child needs the continued support of his/her mother during meals to support his/her "sense of self" with regular and predictable daily experiences. Furthermore, the child needs support for his/her developing autonomy, which is expressed in the early years of life through the desire to feed oneself.

When insensitive mothers misinterpret their child's cues during feeding interactions, they are likely to react with ineffective discipline strategies, such as taking control and dominating the feeding situation – or, conversely, ignoring the child. In both cases, insensitive mothers may not only override their child's internal hunger and satiety regulatory cues, but they may also interfere with their child's emerging autonomy and striving for competence (Birch et al., 2003). In such situations, mealtimes may become stressful for both parties, potentially leading to the child's feelings of frustration, inattention to internal cues, lack of self-reliance, and disinterest in communicating feeding cues to the mother (Black & Aboud, 2011). This is well documented by research showing that high maternal intrusiveness (Feldman et al., 2004; Silberstein et al., 2009), low maternal sensitivity (Ammaniti et al., 2004; Bilgin & Wolke, 2017; Hagekull et al., 1997), greater infant negativity and withdrawal (Polan et al., 1991; Sanders et al., 1993; Silberstein et al., 2009), and more struggles for control (Chatoor, 2000; Stein et al., 2006; Wolke et al., 1990) characterize negative mother–child relational patterns with respect to feeding.

Insofar as both mother–child interaction patterns and early dietary behaviors track over time (Feinstein et al., 2008), mothers should be helped to establish sensitive interaction patterns and food habits with their child in the child's first years of life (Black & Aboud, 2011). However, although the role of maternal sensitivity in enhancing healthy food habits has been recognized (Ainsworth & Russel, 1972), as mentioned above, most interventions to prevent under/overweight children give limited attention to the mother–child interaction during early feeding experiences; rather, these interventions privilege nutritional/educational objectives (World Health Organization, 2002). To this end, the present study tested the effectiveness of an attachment-based intervention – the Video-feedback Intervention to promote Positive Parenting and Sensitive Discipline (VIPP-SD; Juffer et al., 2008, 2017a, 2017b) – in enhancing food habits via increased parental sensitivity in a sample of Colombian rural low-SES mothers and their children, aged 1–3 years.

The VIPP-SD (Juffer et al., 2008, 2017a, 2017b) is a short-term behavioral intervention that was designed to enhance parental sensitivity and sensitive discipline in families with children aged 1–6 years. Sensitive discipline refers to parents' ability to consider their child's perspective and signals when discipline is required, and it includes child-oriented discipline methods such as induction (Hoffman, 1984) and empathy for the child when he/she is frustrated or angry (Lieberman, 2004). The VIPP-SD has been implemented and tested in a range of family types, including clinical and at-risk families, showing an overall effect size of Cohen's $d = 0.47$ in positively affecting sensitive parenting in 12 samples comprised of 1,116 parents/caregivers (Juffer et al., 2017a, 2017b). However, to date, the intervention has not been applied with the specific aim of improving maternal food habits, with the exception of one study that targeted mothers with eating disorders in order to encourage sensitive food practices with their child (Stein et al., 2006).

From the age of 18 months, children become increasingly autonomous and selective about their food preferences. At this point, they may be encouraged to eat and taste a variety of foods when their mothers are not only responsive to their hunger and satiety cues, but also when they use sensitive discipline strategies in response to challenging child behavior (e.g., when a child throws food on the ground) and show sensitive – rather than neglecting – attitudes towards food habits, including an open and flexible attitude to food variety. In this vein, given its focus on both maternal sensitivity and maternal discipline, the VIPP-SD seems particularly well suited to enhance maternal food habits via increased parental sensitivity. Mothers stand to greatly benefit from any intervention that equips them with sensitive discipline strategies to incorporate into their food habits. Such strategies may entail positive encouragement (e.g., explicitly complimenting the child for positive behavior), appropriate pacing (i.e., allowing the child sufficient time to adapt to the situation), relinquished control (e.g., allowing the child to eat autonomously when he/she is able and willing), and understanding the child's preferences (Mesman et al., 2018).

Present study

The main aim of the present study was to test the effectiveness of the VIPP-SD in enhancing maternal food habits via increased sensitivity in a sample of Colombian rural low-SES mothers and their children (aged 1–3 years) using a randomized controlled trial (RCT). The study was conducted in Soracá, which is a municipality in the Colombian Department of Boyacá, within the subregion of the Central Boyacá Province on the Andes mountains. In this municipality, poverty rates are high and mothers are likely to be poorly educated (E.S.E Centro de Salud Fe y Esperanza Soracá, 2020); the most important agricultural products are potatoes, corn, and, to a lesser extent, milk (Salazar-Jiménez & Del Pilar Torres-Tovar, 2018). Soracá has a population of 5,226, with 748 (14.3%) in the urban area and 4,478 (85.7%) in the rural area, distributed across 11 municipal villages.

On the basis of the literature discussed above, it was hypothesized that:

(1) the VIPP-SD would be effective in increasing maternal sensitivity and food habits, both post-intervention and at a 6-month follow-up; and
(2) increased maternal sensitivity following the VIPP-SD would be a mechanism of change for maternal food habits, both post-intervention and at the 6-month follow-up.

Method

Participants

Mothers were selected from the database of the "Grow and Develop" program promoted by the municipal health center "Fe y Esperanza" in the rural sector of the municipality of Soracá (Boyacá, Colombia). From the initial sample of 40 mothers who met the study criteria (i.e., having a child aged 1–3 years with no disability and living in the low-SES rural area of Soracá) and were contacted by phone by students of social work, 25 voluntarily agreed to participate (62.5%). At pre-intervention (t1), mothers' mean age was 31.16 years

(SD = 7.77; age range = 18–47 years), with a mean of 6.64 (SD = 3.32) years of education. Seventeen mothers (68.0%) lived in a nuclear family, whereas 8 mothers (32.0%) lived in an extended family (e.g., with parents and/or siblings). Twenty mothers (80.0%) were housewives, whereas 4 (16.0%) were employees and 1 was a farmer (4.0%). Fourteen children (56.0%) were girls and 11 (44.0%) were boys, with a mean age of 25.04 months (SD = 5.56; age range = 16–36 months). The mean number of children per family was 2.28 (SD = 1.14; range = 1–5). Eleven children (44.0%) attended a childcare center, whereas 14 children (56.0%) did not. Participants' complete socio-demographic characteristics by group for each time point are displayed in Table 1.

Procedure

The study was approved by the Ethics Committee of the University of Pavia. In each family, the VIPP-SD was implemented with the mother and one child, according to the VIPP-SD manual (Juffer et al., 2008). One family had multiple children in the age of interest (1–3 years); in this case, the youngest child was selected for the study.

Table 1. Socio-demographic information by group (N = 25).

	VIPP-SD group (n = 12)	Control group (n = 13)	Fisher's exact test		
Child gender			p = .695		
Male	6 (50.0%)	5 (39.5%)			
Female	6 (50.0%)	8 (61.5%)			
Family type			p = .673		
Nuclear family	9 (75.0%)	8 (61.5%)			
Extended family	3 (25.0%)	5 (38.5%)			
Mother occupation			p = .787		
Housewife	9 (75.0%)	11 (84.6%)			
Farmer	1 (8.3%)	0			
Employee	2 (16.7%)	2 (11.4%)			
Children attending childcare center			p = 1.00		
Yes	5 (41.7%)	6 (46.2%)			
No	7 (58.3%)	7 (53.8%)			
	M (SD)	*M (SD)*	$F_{(df)}$	p	η_p^2
Child age (months)			1.26$_{(1,23)}$	.273	.05
Pre-intervention	23.25 (4.85)	26.69 (5.85)			
Post-intervention	36.33 (4.74)	40.69 (4.92)			
Follow-up	43.32 (4.56)	47.54 (5.11)			
Mother age (years)			0.28$_{(1,23)}$	.603	.01
Pre-intervention	32.00 (6.97)	30.38 (8.65)			
Post-intervention	33.00 (6.97)	31.38 (8.65)			
Follow-up	33.75 (6.92)	32.00 (8.56)			
Number of children			1.66$_{(1,23)}$	.210	.07
Pre-intervention	2.58 (1.24)	2.00 (1.00)			
Post-intervention	2.58 (1.24)	2.08 (0.95)			
Follow-up	2.67 (1.16)	2.08 (0.95)			
Mother education (years)			1.98$_{(2,22)}$	.173	.08
Pre-intervention	5.75 (3.42)	7.46 (3.13)			
Post-intervention	5.92 (3.42)	7.77 (3.17)			
Follow-up	6.08 (3.53)	8.08 (3.38)			
Monthly income (USD)			0.69$_{(1,23)}$	.413	.03
Pre-intervention	73.92 (71.22)	60.31 (55.14)			
Post-intervention	77.50 (65.45)	59.54 (49.11)			
Follow-up	86.33 (63.88)	61.54 (49.10)			

Extended family included parents, brothers, and/or sisters. F is presented as the main effect for group in the mixed model analysis.

Participants were assessed at baseline (t1) at a single session that occurred 1 week prior to the start of the intervention (i.e., pre-intervention). This session was conducted at participants' homes, due to their limited mobility and to increase study retention. At the start of the session, the research procedures were explained and mothers were asked to sign an informed consent form. Following this, mothers were rated for sensitivity during a 90-minute naturalistic observation of them interacting with their child. Finally, mothers filled in a set of questionnaires about their socio-demographics and food habits.

Researchers randomly assigned each mother–child dyad to either the experimental condition (VIPP-SD) or the control condition (dummy intervention). Block randomization was performed with 1:1 allocation using a computerized random number generator, resulting in 12 mother–child dyads in the VIPP-SD condition and 13 in the control condition (see Figure 1). Mothers agreed to participate prior to randomization into the conditions. Over a period of 4 to 6 months, mother–child dyads in the intervention group received six home visits, while mothers in the control group received six telephone calls dealing with general child developmental issues. Furthermore, both groups received a food habits socio-education intervention by means of three further home visits. During the last home visit (t2) and 6 months following the intervention (t3), both groups were tested again for sensitivity and food habits. At all time points, the researchers who
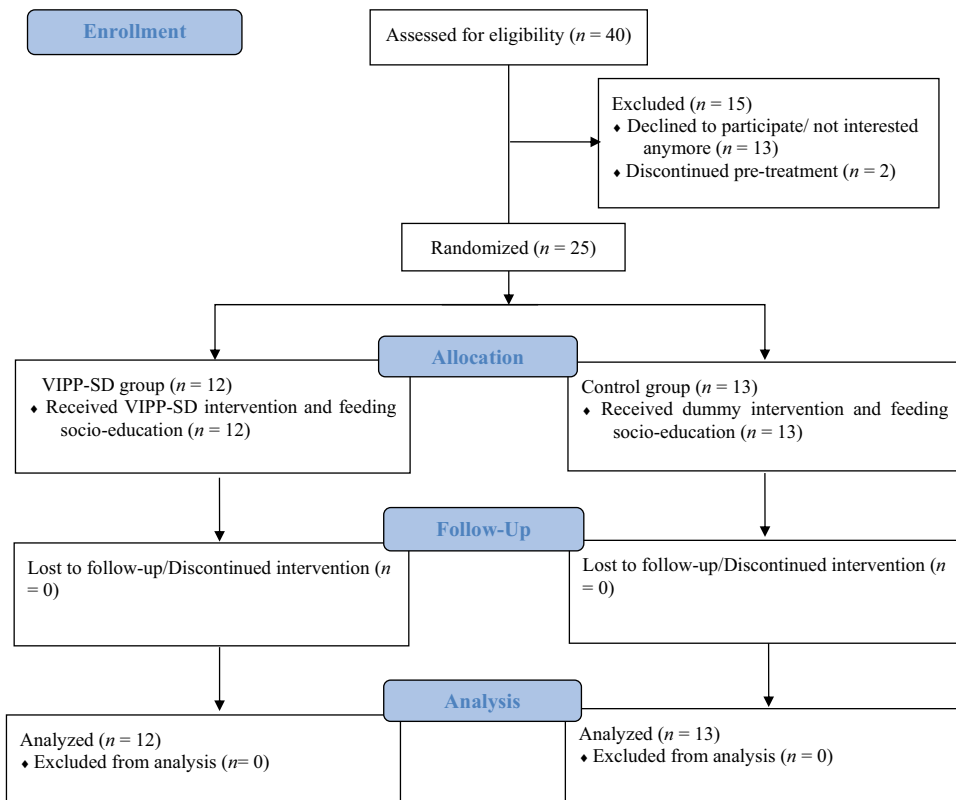

Figure 1. CONSORT flow diagram for sample (dis)engagement in the study (N = 25).

observed and coded the mother–child interactions for sensitivity were blind to the randomization. The researchers also differed at each time point.

Intervention program

Mother–child dyads in the experimental group were administered the short-term intervention program VIPP-SD (Juffer et al., 2008, 2017a, 2017b) to enhance mothers' sensitivity and positive discipline strategies. The intervention was implemented through the standardized protocol of six home visits, assuring that other family members (e.g., fathers, siblings, grandparents) were not present in the home during the visit. The protocol defined themes, tips, and exercises for each mother–child dyad at each visit, according to the specific and tailored profile of maternal strengths and difficulties that was determined at the baseline assessment. More generally, the VIPP-SD is staged across three phases: (1) sessions 1 and 2 aim at building a relationship with the mother, focusing on child behavior and emphasizing positive interactions in the video feedback; (2) sessions 3 and 4 work on improving parenting behaviors, demonstrating effective parenting strategies and alternative situations in which to apply those strategies; and (3) sessions 5 and 6 (booster) review the feedback and information from previous sessions in order to strengthen the effectiveness of the intervention. In the present study, all toys provided by the intervener for the mother–child dyad adhered to the specific cultural habits and constraints of the Colombian low-SES rural area; these included simple toy cars, blocks, dolls, and animals. Books – both with and without text – about relevant issues for the mothers and children (e.g., livestock, agriculture, colors, counting) were also used. At the end of the intervention, mothers received a booklet summarizing the main takeaways of the program. The VIPP-SD was delivered by two interveners who were reliably trained in the intervention protocol.

Control condition

Parallel to the intervention, mothers in the control group received six telephone calls at the same time interval as the VIPP-SD sessions. Following previous studies (e.g., Juffer et al., 2014; Negrão et al., 2014; Van Zeijl et al., 2006), this dummy intervention was implemented in order to ensure comparable motivation and attention in the intervention and control groups and to prevent selective attrition. Each phone call focused on a standard topic of child development (i.e., language, play, sleep, feeding, relations), lasted approximately 10 minutes, and was always conducted by the same researcher, for the purpose of building a strong alliance. Within each phone call, questions were posed, encouraging mothers to talk about the development of their child. However, the researcher provided no tips or advice. Whenever mothers asked for specific advice, they were encouraged to consult their regular practitioners and/or local health service. In order to comply with ethical research principles, when mothers in the control condition completed their participation in the study, they were invited to participate in a VIPP-SD intervention that occurred shortly after the study had completed.

Feeding socio-education intervention

Both groups received a further intervention on eating habits (Burgess & Glasauer, 2006) that was administered during three 45-minute home visits on days following a VIPP-SD intervention or telephone call. The intervention conveyed information on attitudes and practices with respect to children's food habits and nutrition. Specifically, the sessions focused on healthy eating, hygiene, and nutrition, as well as: local knowledge, beliefs and eating habits; local recipes; practices relating to feeding children; and the production, storage, and cooking of foods to promote a healthy, varied, and balanced diet. Sessions were interactive and involved ludic activities. They drew on a simple and compressible vocabulary and occurred during a period of 3 months, with a frequency of one visit per month.

Measures

Maternal sensitivity

At each time point (t1, t2, t3), maternal sensitivity was assessed using the Maternal Behaviour Q-sort (MBQS, version 3.1), as developed by Pederson and Moran (1995) and adapted for the Latin American context by Posada et al. (1999). The MBQS uses the Q-sort methodology to describe maternal behavior during child interaction. It is comprised of 90 items based on Ainsworth's conceptualization of early care, which are sorted on the basis of natural observations lasting approximately 90 minutes, focused on the mother–child relationship during close interaction (e.g., feeding), free play, and other everyday activities. Data in support of its validity have been reported elsewhere (e.g., Moran et al., 1992; Pederson & Moran, 1995, 1996; Pederson et al., 1998, 1990).

All observations were made by two trained and reliable observers who were unaware of the mothers' experimental or control condition and the timing of the assessment. Each observer provided a description of the mothers' behavior. Following the Q-sort methodology, observers initially divided the 90 items into 3 piles: characteristic (piles 7, 8, 9; i.e., items related to recognition of the child's signals, answering according to the child's needs, the child's unlimited physical access to the mother, face-to-face interactions, and adjustment of the mother's body when hugging the child); neither characteristic nor uncharacteristic (piles 4, 5, 6); and uncharacteristic (piles 1, 2, 3; i.e., items related to awareness of the child's cleanliness and arrangement, and trial and error to satisfy the child during interactions). Subsequently, the three piles were further subdivided into 9 piles of 10 items each, ranging from 9 (*most characteristic*) to 1 (*most uncharacteristic*). The pile number in which an item was placed was used as the rating for that item. Any disagreements (whereby items were placed more than three piles apart) were resolved via discussion (Posada et al., 2004). The total score for a given mother was correlated with the developers' criterion sort for the prototypically sensitive caregiver, generating a global sensitivity score. Scores varied from −1 (*least like the prototypically sensitive mother*) to 1 (*most like the prototypically sensitive mother*). At t1, sensitivity was rated live, whereas at t2 and t3, scores were produced from video footage, in line with studies showing the comparability of the two methods in rating accuracy (e.g., Eisler et al., 1973; Ryan et al., 1995). At each time point, two different observers coded all interactions ($n = 75$), resulting in an inter-observer reliability (single rater, absolute agreement) of .76.

Food habits

At each time point (t1, t2, t3), mothers also completed the Knowledge, Attitude, and Practices (KAP) survey (Fautsch & Glasauer, 2014) to capture their knowledge, attitudes, and practices relating to nutrition, diet, food, and closely related hygiene and health issues. The KAP survey consists of 13 modules of predefined questions measuring critical knowledge, attitudes, and practices related to the 13 most common nutrition issues. In the present study, mothers answered modules: (a) Feeding young children; (b) Undernutrition; (c) Personal hygiene, and (d) Water and sanitation. Taken together, these modules comprise 49 items. Accordingly, in the present study, item scores were summed to produce a unique summary score ranging from 0 (*does not apply*) to 1 (*does apply*) (score range: 0–49), with higher scores indicating more positive food habits.

Analytic plan

Preliminary analyses were conducted to ensure that no differences existed between the two groups at pre-intervention. To test our first hypothesis on the effectiveness of the VIPP-SD in enhancing mothers' sensitivity and positive food habits post-intervention and at a 6-month follow-up, two mixed models were performed. The mixed model design enabled us to control for the nested nature of the data (i.e., the same 25 mothers were evaluated across three time points and, thus, provided 75 observations for each outcome variable). Then, to understand the nature of the time*group interaction, a simple effect analysis (contrasts) was run. To test our second hypothesis – that changes in maternal sensitivity would be associated with enhanced food habits at both post-intervention (t2) and follow-up (t3) – two mediation models were performed, with group used as a predictor, changes in maternal sensitivity used as a mediator, and changes in food habits used as an outcome. Changes in maternal sensitivity and food habits at t2 and t3 were computed using the difference scores from pre- to post-intervention (Model 1) and from pre-intervention to follow-up (Model 2), respectively. This conservative approach enabled us to examine the unique impact of changes in maternal sensitive discipline on post-intervention and follow-up food habits, irrespective of pre-intervention food habits.

Results

Preliminary analyses

Random assignment to the control and intervention groups was checked by performing Fisher's exact tests and t-tests for, respectively, demographic variables and pre-intervention sensitivity and food habits. As displayed in Table 1, no differences were found between the control and intervention groups regarding maternal age, education, or occupation; child age or gender; family structure; number of children; or childcare center attendance. Likewise, VIPP-SD and control mothers showed similar levels of pre-intervention sensitivity, $F(1,23) = 2.15$, $p = .157$, $d = .29$, and food habits, $F(1,23) = 0.01$, $p = .918$, $d = .05$.

Was the VIPP-SD effective in enhancing mothers' sensitivity and positive food habits post-intervention and at the 6-month follow-up?

Regarding maternal sensitivity, the linear mixed model analysis indicated that neither group, $F(1,23) = 1.38$, $p = .252$, nor time, $F(2,46) = 1.05$, $p = .358$, had a significant effect. Conversely, the interaction group*time was significant, $F(2,46) = 12.61$, $p < .001$. A simple effects analysis was run to explore the nature of the interaction. Findings highlighted the effectiveness of the VIPP-SD in enhancing mothers' sensitivity at post-intervention, estimate = .20, $p = .028$; further, these changes remained stable over time, since VIPP-SD mothers continued to show greater sensitivity relative to control mothers at the 6-month follow-up, estimate = .21, $p = .024$.

Regarding maternal food habits, the linear mixed model analysis indicated a significant effect of both group, $F(1,23) = 6.25$, $p = .020$, and time, $F(2,46) = 160.56$, $p < .001$. Specifically, VIPP-SD mothers reported more positive food habits relative to mothers in the control group, estimate = 2.09, $p = .020$. Likewise, food habits improved from pre- to post-intervention, estimate = 6.24, $p = < .001$, and from pre-intervention to follow-up, estimate = 8.23, $p = < .001$. The interaction group*time was further significant, $F(2,46) = 7.09$, $p = .002$. A simple effects analysis showed that the VIPP-SD was effective in enhancing mothers' food habits at post-intervention, estimate = 2.30, $p = .028$. Again, these changes remained stable over time, since VIPP-SD mothers continued to report better food habits relative to control mothers at the 6-month follow-up, estimate = 3.85, $p < .001$. At pre-intervention, mothers in both groups reported similar levels of food habit quality, estimate = 0.12, $p = .905$. Means, standard deviations, and effect sizes for both maternal sensitivity and food habits are displayed in Table 2.

Were changes in maternal sensitivity associated with more positive food habits post-intervention and at the 6-month follow-up?

The second hypothesis was designed to test whether changes in sensitivity in VIPP-SD mothers led to more positive food habits, both post-intervention and at the 6-month follow-up. Confidence intervals were evaluated using the bootstrap percentiles method. Findings indicated that the VIPP-SD did not directly improve maternal food habits, either at post-intervention or at the follow-up; rather, at both times, these pathways were uniquely mediated by changes in maternal sensitivity. Said another way, mothers who received the VIPP-SD intervention reported more positive food habits, both post-intervention and at the 6-month follow-up, following an increase in sensitivity. The model results are displayed in Table 3.

Discussion

In an RCT with Colombian mother–child dyads from the rural area of Soracá (in Boyacá), we conducted the first test of the effectiveness of the attachment-based intervention program VIPP-SD in enhancing maternal sensitivity and food habits both post-intervention and at a 6-month follow-up. We further verified whether maternal sensitivity represented a mechanism of change for food habits and the stability of these habits over time. A first look at the descriptive statistics for sensitivity provides some meaningful

Table 2. Descriptive for maternal sensitivity and food habits by group (N = 25).

	VIPP-SD group (n = 12)			Control group (n = 13)			Group		Time			Group*Time		
	Pre-	Post-	Follow-up	Pre-	Post-	Follow-up	F	d	F	d_1	d_2	F	d_3	d_4
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)								
Maternal sensitivity	.46 (.29)	.68 (.09)	.69 (.09)	.61 (.20)	.50 (.32)	.49 (.23)	1.38	0.15	1.05	0.22	0	12.61***	0.77	1.15
[Range score]	[−.06–.76]	[.50–.83]	[.54–.85]	[.18–.79]	[−.12–.76]	[.12–.75]								
Maternal food habits	35.58 (3.53)	42.92 (1.98)	44.83 (2.21)	35.46 (2.26)	40.62 (2.82)	42.23 (2.71)	6.25*	0.65	160.56***	2.35	0.72	7.09**	0.94	1.05
[Range score]	[27–40]	[39–45]	[41–48]	[31–38]	[34–44]	[36–45]								

F = fixed effects omnibus tests. d_1 = effect size for pre-intervention vs. post-intervention. d_2 = effect size for post-intervention vs. follow-up. d_3 = effect size at post-intervention vs. follow-up. d_4 = effect size at follow-up. *p <.05. **p <.01. ***p <.001.

Table 3. Mediation models with maternal sensitivity as a mediator of the effect of VIPP-SD intervention on maternal food habits at post-treatment and 6-month follow-up, respectively (N = 25).

Type	Effect	Estimate	SE	95% C.I. Lower	95% C.I. Upper	β	p
Model 1: Changes at post-intervention (t2)							
Indirect	Group ⇒ Sensitivity ⇒ Food habits	1.51	0.70	0.25	3.16	.29	.031
Component	Group ⇒ Sensitivity	0.17	0.05	0.09	0.28	.59	<.001
	Sensitivity ⇒ Food habits	8.77	4.44	1.66	19.33	.49	.048
Direct	Group ⇒ Food habits	1.14	0.94	−0.69	3.06	.22	.226
Total	Group ⇒ Food habits	2.65	0.92	0.86	4.45	.51	.004
Model 1: Changes at post-intervention (t2)							
Indirect	Group ⇒ Sensitivity ⇒ Food habits	1.51	0.71	0.25	2.99	.31	.033
Component	Group ⇒ Sensitivity	0.10	0.03	0.04	0.17	.52	.002
	Sensitivity ⇒ Food habits	14.60	3.88	4.88	20.21	.60	<.001
Direct	Group ⇒ Food habits	1.28	0.72	−0.23	2.57	.26	.078
Total	Group ⇒ Food habits	2.79	0.81	1.21	4.37	0.58	<.001

Group coded as: 0 = control group, 1 = VIPP-SD group. C.I. = confidence intervals. Confidence intervals were evaluated using the bootstrap percentiles method.

insights into the study findings. The mean scores for VIPP-SD mothers post-intervention and at the follow-up were .68 and .69, respectively. Both scores significantly overlapped with those of the only two existing studies with low-risk urban Colombian mothers (69–.73; Posada et al., 2004, 1999), as well as with the mean score of .73 found by Pederson et al. (1990) in their original study in Canada. In addition, all VIPP-SD mothers were above the sensitivity threshold of .30 to predict security, as set by Pederson et al. (2014). This finding adds further evidence that some of the main components of sensitivity (i.e., availability, proximity, prompt responding, child-centered responsiveness) are universally important aspects of caregiving across different socio-cultural groups (Mesman et al., 2012). Furthermore, although the challenges of implementing evidence-based interventions in low-SES countries are well known (relating to cultural differences; barriers to cost, accessibility, and quality; inadequate familiarity; limited human resources; and lack of workplace support; Hailemariam et al., 2019), increases in maternal sensitivity following the intervention (comparable to those found within medium- to high-SES communities) call for the need to promote the VIPP-SD in low-SES communities, since it may enhance the quality of parenting in the context of at-risk and stressful living circumstances (E.S.E Centro de Salud Fe y Esperanza Soracá, 2020; ENSIN, 2018).

Consistent with our first hypothesis, the VIPP-SD proved effective in enhancing mothers' sensitivity and food habits following the intervention; further, these changes remained stable at the 6-month follow-up. For the control group, changes in sensitivity decreased from pre- to post-intervention, as also found by Negrão et al. (2014) in their RCT with Portuguese poor mothers with children aged 1–4 years. In our study, the decrease remained stable at the 6-month follow-up. The differences in sensitivity found between the VIPP-SD and control mothers suggests that mothers' ability to perceive their child's signals, interpret them correctly, and respond promptly and appropriately (Ainsworth et al., 1978) may decline over time in disadvantaged families if no support is provided. This

is likely due to the chronic and corrosive impact of multiple stressors and neglect in these families' daily lives, in conjunction with the demands of parenting a young child (Belsky et al., 1996).

According to Cohen's (1988) criteria, our effect sizes were sufficiently large to detect changes in sensitivity ($d = 0.77$ post-intervention, $d = 1.15$ at follow-up) and food habits ($d = 0.94$ post-intervention, $d = 1.05$ at follow-up). However, the effect sizes related to the increases in maternal sensitivity were much larger than those reported by Juffer et al. (2017a, 2017b) ($d = 0.47$) for the post-intervention effect of VIPP-SD. This difference may pertain to a number of factors. First, it may be that, in the context of adverse social and economic conditions such as that of rural Colombia, the VIPP-SD intervention is particularly effective in promoting sensitive parenting, as the mothers require support to face the socio-emotional stressors that arise in their daily interactions with their child. In this vein, the VIPP-SD may have helped the mothers in our study adopt more effective and child-oriented discipline methods, such as induction (Hoffman, 1984) and empathy for the child when he/she meets difficulties (Lieberman, 2004). Such methods may become increasingly important for the mothers as they seek to manage their child's behavior during the toddler years (Belsky et al., 1996).

Second, detailed analysis of the video material adds a further explanation. Following the intervention, VIPP-SD mothers showed a particular flexible approach to caregiving that was highly attuned to their child's pace during daily care activities such as bathing and solid food feeding. Therefore, it may be that flexibility in their daily interaction routines facilitated the mothers' easy and prompt adoption of sensitive responsiveness to their child's physical signs (Mesman et al., 2018). Third, the studies included in Juffer et al. (2017a, 2017b) meta-analysis assessed sensitivity using different scales (e.g., Ainsworth Scale, Egeland Scale, Emotional Availability Scale). In this vein, it cannot be overlooked that even established standardized measures of caregiver sensitivity are not interchangeable, as they may evaluate different features of sensitivity to the child, producing different results (Bohr et al., 2018).

Conversely to sensitivity, maternal food habits improved over time in both groups, though they remained more significant in the VIPP-SD mothers. This finding merits further investigation, possibly with a multi-arm RCT involving multiple active interventions. A similar method was recently adopted by Van der Veek et al. (2019), who compared the effectiveness of a vegetable-exposure intervention, a sensitive feeding intervention, and a combined intervention with an attention-control group in a sample of first-time Dutch mothers and their infants. However, for the moment, we can hypothesize that, since both groups received an intervention on eating habits conveying information on attitudes and practices in relation to children's nutritious eating habits, all mothers may have developed better food habits as a result, irrespective of whether they participated in the VIPP-SD. This idea is further corroborated by the significant main effect found for time (and not group) in the mothers' improved food habits, whereas the same main effect was not found for sensitivity.

In addition to anticipating enhanced maternal sensitivity and better food habits following the VIPP-SD, we also expected that increased maternal sensitivity would further improve maternal food habits. Our results supported these predictions, with sensitivity emerging not only as an intervention outcome, but also as a mechanism of change associated with the other intervention outcome (i.e., food habits). Of relevance, although

we applied the original version of the VIPP-SD (Juffer et al., 2008, 2017a, 2017b), which does not specifically focus on how to appropriately feed an infant (showing, e.g., sensitive reactions to the child's hunger and satiety cues and sensitive discipline and autonomy during feeding; Van der Veek et al., 2019), our findings indicated that mothers who interacted more sensitively with their child also reported better knowledge, attitudes, and practices relating to nutrition. This recalls and further supports Ainsworth and Russel (1972)'s idea that sensitivity is a cross-domain parenting behavior that extends to several other mother–child interactive contexts. The findings also support Bowlby's claim that feeding interactions provide excellent opportunities for mothers to attune with their child's signals, rhythms, and social initiatives (Bowlby, 1969/1982). However, whether changes in sensitivity foster better mother–child feeding interactions is not yet known.

Closer inspection of our findings helps to situate them more deeply in the Colombian study context. In keeping with ethological studies showing that infants in non-Western rural cultural contexts have multiple caregivers, Mesman, Minter, and Angnged (2016) adapted the construct of sensitivity to capture "sensitivity as received by the infant by the total caregiving network, regardless of who provides the responsiveness at specific times" (p. 104). Although we did not measure such "received sensitivity," but assessed only maternal sensitivity, it is relevant to note that an extended network of caregivers (i.e., grandparents, aunts, uncles) was integrated into many of the children's daily routines, as indicated by the participants' descriptive characteristics. This being the case, one could claim a possibly spurious effect of the VIPP-SD in increasing sensitivity and, in turn, food habits. Whether the ability to share childcare with other family members alleviated some of the mothers' burden to parent their children, allowing these mothers to be more sensitive during daily interactions, cannot be entirely ruled out and requires further investigation in similar low-SES communities. However, as the percentage of mothers in both groups living in an extended family was not significantly different (25.0% vs. 38.5%), we can be relatively confident of the genuine contribution of the VIPP-SD in determining the results.

Strengths and limitations

Our study presents a number of strengths, including the use of a standardized well-established observational measure of maternal sensitivity (i.e., MBQS; Pederson & Moran, 1995; Posada et al., 1999) and a unique sample, in terms of socio-economic factors. Another strength is the randomized controlled design, involving a pre-/post-intervention and follow-up. In spite of the recent call to test the universality of attachment theory and its related constructs (e.g., parents' sensitivity) outside of urban Western contexts (Mesman, 2018a), RCTs with socio-economically disadvantaged parents from non-Western countries remain rare (for an exception, see Alvarenga et al., 2019). The present study was one of the first to test the effectiveness of the VIPP-SD "off the beaten track" (Mesman, 2018a, p. 2), enabling the preliminary conclusion to be drawn that the improvements observed in our study were solely attributable to the intervention.

Further, our intervention on mothers with children aged 1–3 years was particularly timely, because the contextual demands placed on maternal sensitivity may change over time, especially over the child's first 3 years (Bakermans-Kranenburg et al., 2003). This early developmental period involves significant normative changes as children acquire new

interactive skills to express complex needs, including those of autonomy and exploration (Thompson, 2016). From this perspective, child development may hinge, at least in part, on the mother's capacity to express new modes of sensitive caring that support these developmental acquisitions, especially in rural contexts where low SES, limited living space, and a large household composition may place additional burdens on parenting (Ensminger & Fothergill, 2003). These changes may be qualitative, to the extent that mothers must adopt new behaviors to adjust to their child's novel developmental stages, and quantitative, to the extent that maternal sensitivity increases as a function of improved dyadic synchrony between mother and child (Mills-Koonce et al., 2008).

Finally, it should be noted that attrition in our study occurred only in the early stages, as all mothers were retained once the program started. As noted by Negrão et al. (2014), this is encouraging for the implementation of the VIPP-SD with socio-economically disadvantaged mothers, as the intervention seemed effective in engaging them, despite being energy-consuming and difficult to accommodate in the mothers' daily schedules, which often involved milking cows and other agricultural work. To facilitate the mothers' engagement and capture a more ecological view of their daily environment, VIPP-SD sessions were sometimes conducted in their workplaces, where they usually carried their child. A further factor that likely facilitated study retention was the video-feedback method, which facilitated a non-prescriptive yet heightened awareness of the child's emotions and signals and the impact of the mother's behavior on the child (Juffer et al., 2008, 2017a, 2017b; Juffer & Steele, 2014). This collaborative approach, which enabled the mothers to develop a trusting relationship with the intervener over the course of the sessions, was especially relevant to the low-SES and rural Colombian mothers, who likely had a history of "being told what to do" by professionals from various institutions. Such efforts resulted in positive evaluations of the VIPP-SD once all sessions were completed. In particular, the mothers appreciated the significant impact of the VIPP-SD on improving their understanding of their child's thoughts and feelings, as well as their communication and relationship with their child.

Several limitations should be considered when interpreting the findings. First, the very limited sample size restricted our confidence in the stability and generalizability of the findings, even though the longitudinal design across three time points enabled us to gather 75 observations for each outcome. In this vein, the difficulties of recruiting and retaining low-SES/minority groups in research are well documented (Nicholson et al., 2011). However, parenting intervention studies in such samples are extremely important, both for informing a culturally-sensitive approach to (even universal) theoretical constructs such as sensitivity (Mesman, 2018a, 2018b; Mesman et al., 2018, 2012) and for improving the lives of low-SES parents, insofar as such interventions may represent unique opportunities for them to reduce problematic parenting behaviors.

A second limitation of the study is that our evaluation of food habits relied exclusively on mothers' reports. The intervention may have trained mothers to say the "right things" about nutrition, without necessarily changing their feeding practices. Thus, it is important that future studies verify that our model of change (i.e., VIPP-SD ⇒ sensitivity ⇒ food habits) indeed improves maternal feeding behavior during mother–child interaction, given that maternal sensitivity, in general (Ammaniti et al., 2004; Bilgin & Wolke, 2017; Hagekull et al., 1997), and responsive feeding, in particular (Black & Aboud, 2011; Chatoor, 2000; Chatoor et al., 1997), have been found to prevent child feeding problems. This

would effectively extend the application of the VIPP-SD to feeding contexts in low-SES communities such as Colombia, where mothers' sensitive reactions to their child's hunger and satiety cues, as well as their sensitive discipline and autonomy support during feeding, are essential for optimal child development and, in some cases, preventative of child malnutrition (Black & Aboud, 2011; ENSIN, 2018). A final limitation of the study is that we did not evaluate mothers' attachment mental states, because doing so would have required additional effort on the part of the mothers that was irreconcilable with their household duties. There is evidence that the VIPP-SD intervention may be more effective when tailored to the mother's insecure attachment style: dismissing mothers tend to benefit more from brochures and video feedback, whereas preoccupied mothers tend to benefit more from additional attachment-related discussions (Bakermans-Kranenburg et al., 1998).

Conclusion

The present study contributes to the emerging literature on attachment-based interventions in low-SES communities (Alvarenga et al., 2019; Mesman, 2018a; Mesman, van IJzendoorn, et al., 2016) by proposing – for the first time – a model of change in which the VIPP-SD can be used to enhance maternal food habits via increased parental sensitivity. On a social policy level, the findings suggest that interventions aimed at preventing under/overweight children due to inadequate maternal food habits should promote sensitive parenting during daily mother–child interactions, over and above offering nutritional advice (Black & Aboud, 2011; Van der Veek et al., 2019; World Health Organization, 1998). Such an approach would prove helpful in restoring the protective function of sensitive caregiving in contexts of poverty and disadvantage, which are frequently found in developing societies, such as Colombia. In such contexts, a majority of children grow up in an environment with prevalent biological and social risks that may harm their development (E.S.E Centro de Salud Fe y Esperanza Soracá, 2020; ENSIN, 2018). Under these circumstances, the promotion of healthy food habits through evidence-based attachment interventions is critical, as individual differences in mothers' ability to provide sensitive care may benefit other parenting behaviors (Ainsworth & Russel, 1972; Chatoor et al., 1997), including those practiced in the feeding context.

Disclosure statement

No potential conflict of interest was reported by the authors.

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