Associations between maternal sense of coherence and controlling feeding practices: The importance of resilience and support in families of preschoolers

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Abstract

Sense of Coherence (SOC) measures an individual's positive, or salutogenic, orientation toward her/his capacities, environment, future, and life. SOC comprises three factors: comprehensibility (the sense of one's own life as ordered and understandable); manageability (the perception of available resources and skills to manage stressors); and meaningfulness (the overall sense that life is filled with meaning and purpose). In numerous studies, SOC has been associated with resilience to stress. However, associations between parental SOC and controlling feeding practices have yet to be studied. This study examines the validity of the SOC 13-item, 3-factor questionnaire, associations between SOC and maternal and child characteristics, and associations between SOC and use of pressuring or restrictive feeding, among mothers of 4-year-olds. 565 mothers (23.5% of foreign origin, 30.3% with overweight/obesity) recruited via the Swedish population registry (response rate: 65%), completed the SOC–13, the Child Feeding Questionnaire (CFQ), and a background questionnaire. The validity of SOC-13 was examined using confirmatory factor analysis; associations with background characteristics and feeding practices were tested with structural equation modeling. SOC-13 validity testing showed acceptable fit (TLI = 0.93, CFI = 0.94, RMSEA = 0.06, SRMR = 0.04) after allowing one pair of error terms to correlate. The Cronbach's alpha for meaningfulness was 0.73, comprehensibility 0.76, and manageability 0.75. SOC increased with mothers' Swedish background and education, and decreased with higher BMI. Child gender, age, and BMI, were not associated with SOC. Lower SOC was associated with controlling practices and with concern about child weight and eating. The associations between SOC and feeding suggest that SOC-related parameters could inform childhood obesity research, and that prevention should address the socioeconomic barriers that parents face in building resilience to stress.

Keywords

Children; Feeding practices; Obesity; Parents; Sense of coherence; Stress; Validity

1. Introduction

Stress, and the responses it elicits, is central to decision-making and emotional wellbeing throughout a person's life. Parents who are stressed, anxious, or depressed tend to engage in less responsive feeding practices (El-Behadli et al., 2015, Goulding et al., 2014, Haycraft et al., 2013, Mitchell et al., 2009 and Shankardass et al., 2014); moreover, moments of stress can have immediate impact on parenting practices (Dunton et al., 2015 and Engel et al., 2016). Mothers with depression are more likely to use controlling feeding (Goulding et al., 2014, Haycraft et al., 2013, Hurley et al., 2008 and Mitchell et al., 2009), and to perceive their children as fussy eaters (Kochanska and Kim, 2013 and Natsuaki et al., 2010). Mothers with depressive symptoms are also more likely to use food to comfort children, and less likely to be responsive to children's feeding cues (Savage & Birch, 2016). These dynamics of affect, responsiveness, and feeding may lead to obesity; associations between depressive symptoms in mothers and increased obesity rates in children have been reported in three systematic reviews that included cross-sectional and longitudinal studies (Benton et al., 2015, Lampard et al., 2014 and Milgrom et al., 2012). While these studies have highlighted the importance of mothers' negative affect for child feeding and weight status, it is important to examine how mothers' resilience to stress, as measured by sense of coherence, might impact on feeding.

Sense of Coherence (SOC) is a theoretical concept that stems from salutogenesis – a positive psychology approach that emphasizes protective factors that enable people to stay well (Eriksson and Lindstrom, 2006 and Griffiths et al., 2011). SOC describes an individual's positive orientation toward her/his capacities, environment, future, and life, and is comprised of three interrelated dimensions – comprehensibility, manageability, and meaningfulness (Antonovsky, 1993 and Antonovsky, 1996). Specifically, *comprehensibility* measures the person's sense that her/his own life is ordered and understandable; *manageability* measures the person's perception that resources and skills to manage stressors are readily available; and *meaningfulness* measures the person's overall sense that life is filled with meaning and purpose, and that it is, therefore, worthwhile to manage stressors. In numerous studies with both clinical and non-clinical populations SOC have been associated with individuals' ability to cope with stress (Agardh et al., 2003, Anke and Fugl-Meyer, 2003, Moksnes and Haugan, 2015 and Zielinska-Wieczkowska et al., 2012); therefore, SOC is often referred as a measure of resilience to stress.

Using SOC with parents of preschoolers to assess the relationship between parental resilience to stress and feeding practices can add valuable insights to the development of childhood obesity interventions. Parents with a poorer sense of coherence may be more likely to use controlling feeding strategies linked to childhood obesity – that is, restriction, pressure to eat and monitoring. Since restrictive and pressuring feeding practices are not aligned with children's own hunger cues, these practices might reduce children's ability to regulate their eating (DiSantis, Hodges, Johnson, & Fisher, 2011McPhie, Skouteris, Daniels, & Jansen, 2014). Consequently, controlling feeding practices have been associated with higher weight status in children (Birch et al., 2003, Faith and Kerns, 2005, Fisher and Birch, 1999a, Rollins et al., 2015 and Ventura and Birch, 2008). However, longitudinal research found associations between controlling feeding and children's weight loss (Campbell et al., 2010), implying that, in some cases, such strategies can be used effectively to manage children's obesity. Recent longitudinal studies have indicated that feeding practices and child weight have a bidirectional association, with children's overweight both prompting, and resulting from, changes in parental feeding practices (Afonso et al., 2016, Jansen et al., 2014 and Rhee et al., 2009).

Maternal and child characteristics may be of interest when examining the association between SOC and controlling feeding practices. According to Antonovsky, people who have high SOC levels have a greater capacity to recognize and use 'general resistance resources (GRR)' – both internal (person-based, such as education) and external (environment-based, such as social support) – in coping with stress (Antonovsky, 1979, Antonovsky, 1993 and Antonovsky, 1996). Research has confirmed that higher education and social support are two factors often associated with higher SOC levels (Ahlborg et al., 2013, Groholt et al., 2003 and Wolff and Ratner, 1999). Mothers of older children report higher SOC, which suggests that being a parent of small children is especially stressful (Ahlborg et al., 2013). Maternal education has also been associated with use of controlling feeding practices; most studies have found that mothers with higher education use controlling feeding less often (McPhie et al., 2014). The potential influence of child characteristics, such as age and gender, on parents' use of controlling feeding remains largely unstudied. Only one study has examined associations between parental feeding practices and the child's gender, finding no significant differences (Blissett, Meyer, & Haycraft, 2006). Even less is known about the potential influence of the child's age on parental feeding practices (Baranowski et al., 2013 and Musher-Eizenman and Kiefner, 2013).

The aims of this study were three-fold. The first was to confirm the validity of the SOC-13 in mothers of preschoolers, by examining its psychometric properties in this population for the first time to our knowledge. The study predicted that the three factors would be closely related, as suggested by Antonovsky (Antonovsky, 1993) and as shown in previous validation studies (Larsson and Kallenberg, 1999 and Soderhamn and Holmgren, 2004). The second aim was to test associations between SOC-13 scores and self-reported maternal and child demographics. Because research on links between SOC and background factors is inconclusive, the study examined the influence of all available background factors, with the guiding assumption that parental education and foreign origin would show clear links to SOC. The third aim was to examine associations between SOC and controlling parental feeding practices, adjusting for child and parental characteristics. The working hypothesis was that higher total scores on the SOC-13 would be associated with reduced likelihood to engage in restrictive or pressuring feeding practices.

2. Method

2.1. Data collection

The addresses of all female guardians of children aged 4 years residing in Malmö in July 2009 were collected using the Swedish Population Registry. During the first phase of the study, a total of 3007 female guardians (referred to as "mothers" in the rest of the paper; 98% of participants reported they were the children's biological mothers) received the Child Feeding Questionnaire (CFQ) (Birch et al., 2001), a background demographic and anthropometric questionnaire, and a participant information sheet with a consent form. A reminder message was sent by post within one week of the initial questionnaire mailing. Of the 3007 women contacted for the study, 876 completed and mailed the background questionnaire and the CFQ back to the research group. Those who responded in phase 1 were representative of the Malmö population, with regard to body mass index (BMI) and country of birth; however, the mothers who took part in the study were more likely to have had higher education (59% had university or college education, versus 42% of women in the general population). Among the children, a larger proportion than expected had overweight or obesity (12.8% versus 10% in the general population). In the second phase of the study, the CFQ and background questionnaires were sent again to the 876 participants who completed these

questionnaires in phase 1, and the SOC-13 questionnaire was added to the assessment battery. A total of 565 participants completed and returned all questionnaires in phase 2 (65% response rate). The only difference between those who participated in phase 1 only and those who participated in both phase 1 and phase 2 was in level of education, which was higher among phase 2 participants (65.5% of phase 2 participants had university education, versus 49.3% of phase 1 and phase 2 participants, $p < 0.0001$). The study was approved by the Regional Ethical Board in the south of Sweden; written consent was obtained from all participants.

2.2. Sample characteristics

The mothers' mean age was 36.1 years (SD 4.7); their mean BMI, based on self-reported height and weight, was 24.0 (SD 4.0), and 30.3% had a BMI that matched criteria for overweight or obesity; 76.7% of mothers were Swedish born. The foreign-born participants cited 63 countries of origin, with the top five non-Nordic countries being Iraq, Lebanon, Iran, Poland, and Bosnia and Herzegovina (Nowicka and Flodmark et al., 2014 and Nowicka and Sorjonen et al., 2014). The children's mean age was 4.5 years (SD 0.4, range 4.0–5.0); 47% of children were girls, and 12.9% of the children had a BMI that matches criteria for overweight or obesity, based on the mothers' reports of the children's heights and weights. With regard to country of origin and BMI, the mothers were representative of the wider female population of Malmö; however, the mothers reported higher levels of education compared to the general population of Malmö (Statistics Sweden, 2008). Compared to the child population BMIs recorded in Malmö primary health care statistics, a higher percentage of the children had a BMI that matched criteria for obesity (6.4 vs 2.3) (Child Health Care Centre, 2011). Additional details about the sample have been provided elsewhere (Nowicka and Flodmark et al., 2014 and Nowicka and Sorjonen et al., 2014).

2.3. The SOC-13

The SOC-13 is the short version questionnaire of the SOC-29. The SOC-13 has been confirmed by previous factor testing (Eriksson & Lindstrom, 2005), and is comprised of three interrelated factors. The first is *comprehensibility* (cognitive component), with five items (e.g. "Do you have the feeling that you are in an unfamiliar situation and don't know what to do?"); the second factor, *manageability* (instrumental/behavioral component), includes four items (e.g. "Do you have the feeling that you're being treated unfairly?"); the third factor, *meaningfulness* (emotional/motivational component), includes four items (e.g. "How often do you have the feeling that there's little meaning in the things you do in your daily life?"). Each item was scored on a 7–point scale. Higher scores indicated a stronger sense of coherence. The SOC-13 has been translated and used in cross-sectional and longitudinal studies, conducted in 32 countries, which involved a variety of populations (Eriksson & Lindstrom, 2005), including adolescents (Garcia-Moya et al., 2012 and Moksnes and Haugan, 2015), pregnant women (Ferguson, Davis, Browne, & Taylor, 2015), first-time parents (Ahlborg et al., 2013), the parents of very low birth weight children (Huhtala et al., 2014), the parents of children with chronic illnesses (Groholt et al., 2003), twin young adults (Silventoinen et al., 2014), and elderly people (Soderhamn & Holmgren, 2004), among others. However, the SOC has not been used, to our knowledge, among parents of preschool aged children in association with obesity-related factors, such as controlling parental feeding practices. While the validity and reliability of SOC-13 were found to be good in a comprehensive, cross-cultural literature review from 2005 (Eriksson & Lindstrom, 2005), newer validity testing was less satisfactory in at least two cases (Ferguson et al., 2015 and Jakobsson, 2011). In a study conducted among pregnant women in Australia, the

SOC-13 construct validity was acceptable only after removing 4 items (Ferguson et al., 2015), whereas in a study conducted among elderly people in Sweden, construct validity could not be confirmed (Jakobsson, 2011). Continuous testing of the SOC-13 is needed, therefore, especially when the questionnaire is used with a new population. The version of SOC-13 tested in this study was translated to Swedish and back-translated by two bi-lingual researchers, in close dialogue with Aaron Antonovsky, the instrument's developer. At the time of translation, Antonovsky was a guest professor at the University of Lund, where the validity testing was performed (Dahlin & Cederblad, 1986).

2.4. The CFQ

The 31-item Child Feeding Questionnaire (CFQ) (Birch et al., 2001) is a widely used instrument (Vaughn, Tabak, Bryant, & Ward, 2013) that measures parents' perceptionsand concerns regarding childhood obesity, child-feeding attitudes, and child-feeding practices. The Swedish version of CFQ was recently validated (Nowicka et al., 2014) showing a good fit (CFI = 0.94, TLI = 0.95, RMSEA = 0.04, SRMR = 0.05) after excluding two items: item RST3A ("I offer sweets [candy, ice cream, cake, pastries] to my child as a reward for good behavior") and item RST3B ("I offer my child her favorite foods in exchange for good behavior"). These items are often referred to as "reward" items. The internal reliability was good for the majority of the seven factors (Cronbach alpha 0.64–0.84), as well as for the 2-week test-retest reliability (correlations 0.71–0.89). In this study, we used scores from three factors that assess parental feeding practices and one factor that assesses parental concern. The first factor was *restriction*, consisting of six items that assess the extent to which parents limit their child's access to foods (Cronbach alpha 0.63). The second factor was *pressure to eat*, consisting of four items that assess parents' tendency to pressure their children to eat more (Cronbach alpha 0.70). The third factor, *monitoring*, consisted of three items that assess the extent to which parents supervise their child's eating (Cronbach alpha 0.76). An additional factor was *concern about child weight*; this factor consisted of three items that assess the extent to which parents are concerned about their child becoming overweight or eating foods with too much fat or sugar (Cronbach alpha 0.84). The mean score of the items that comprise each subscale is the factor score.

2.5. Background questionnaire

The background questionnaire included questions about children's age, gender, weight, height, and place of birth. The mothers were asked about their age, place of birth, educational level, weight, and height. Parental weight status was categorized according to BMI criteria set by the World Health Organization (World Health Organization, 2000). To define the child weight categories used in this study, international age and gender specific BMI cut offs were used (Cole, Bellizzi, Flegal, & Dietz, 2000).

2.6. Statistical analysis

SPSS version 22 was used to carry out the descriptive analyses of the demographic data, as well as the reliability calculations (Cronbach's alpha). To test the first hypothesis, confirming the validity of the SOC-13, confirmatory factor analysis (CFA) was performed, using MPlus version 7.11, with Maximum Likelihood with Robust standard errors (MLR) estimation. CFA was selected for this validity analysis because hypotheses about the factorial dimensions of the SOC-13 are known, based on previous analyses and theory (De Vet, Terwee, Mokkink, & Knol, 2011). To examine fit to the data, four commonly recommended fit indices were used (Hu & Bentler, 1999): the comparative fit index (CFI), the Tucker-Lewis Index (TLI), the root mean square error of approximation (RMSEA) and standardized root mean square

residual (SRMR). Adequate fit was indicated by CFI and TLI values over 0.90 (Norman & Streiner, 2009) and good fit was indicate by values over 0.95, a RMSEA of 0.06 or lower and a SRMR of 0.08 or lower (Hu & Bentler, 1999).

To test the second hypothesis, a structural equation model (SEM) analysis was conducted, again using MPlus version 7.11. The latent variable sense of coherence (SOC) was regressed on the background variables child's sex, child's age, child's BMI, mother's foreign background, mother's level of education, and mother's BMI.

To test the third hypothesis, analyzing associations between the SOC-13 and CFQ subscales, structural equation modeling was performed. This also was conducted using MPlus version 7.11. The use of SEM allowed for measurement error in variables (Bollen, 1989) and enabled the analysis of mediated effects, while increasing the power of the analyses. Effect sizes were assessed according to Cohen (0.1–0.3 weak; 0.3–0.5 medium, 0.5–1 strong) (Cohen, 1983). All p-values <0.05 were regarded as statistically significant.

3. Results

3.1. Psychometric evaluation of SOC-13

The three subscales were found to be satisfactorily homogenous, as measured by Cronbach's alpha: Meaningfulness = 0.73, Comprehensibility = 0.76, and Manageability = 0.75. The full scale had an alpha value of 0.89. A first CFA revealed mediocre fit, $\chi^2(62) = 339$, $p < 0.001$; TLI = 0.809; CFI = 0.848; RMSEA = 0.089 (90% CI: 0.080–0.098), SRMR = 0.059. However, in a second CFA, the fit was significantly improved by letting the error terms of items 2 and 3 correlate, $\chi^2(61) = 166$, $p < 0.001$; TLI = 0.926; CFI = 0.942; RMSEA = 0.055 (90% CI: 0.045–0.065), SRMR = 0.041. As the three factors – meaningfulness, comprehensibility, and manageability – were very strongly correlated (with the correlations being 0.85, 0.88, and 0.94, respectively), a decision was made to treat them as indicators of a second order factor called "sense of coherence". This did not affect the model fit, such that the model remained as established in the second CFA.

3.2. Associations with background characteristics

The regression effects of the background variables on SOC were calculated; these regression effects are presented in Fig. 1. This model showed acceptable fit, $\chi^2(133) = 323$, $p < 0.001$; TLI = 0.902; CFI = 0.917; RMSEA = 0.040 (90% CI: 0.035–0.046). The analysis revealed that SOC is influenced by the mother's characteristics: foreign background, level of education, and BMI. Specifically, sense of coherence increases with Swedish background (Cohen's d = 0.44, p < 0.001) and level of education (beta = 0.21, p < 0.001), and decreases with BMI (beta = −0.19, p < 0.001). No associations between SOC and the child's characteristics (sex, age, BMI) were found (Fig. 1).

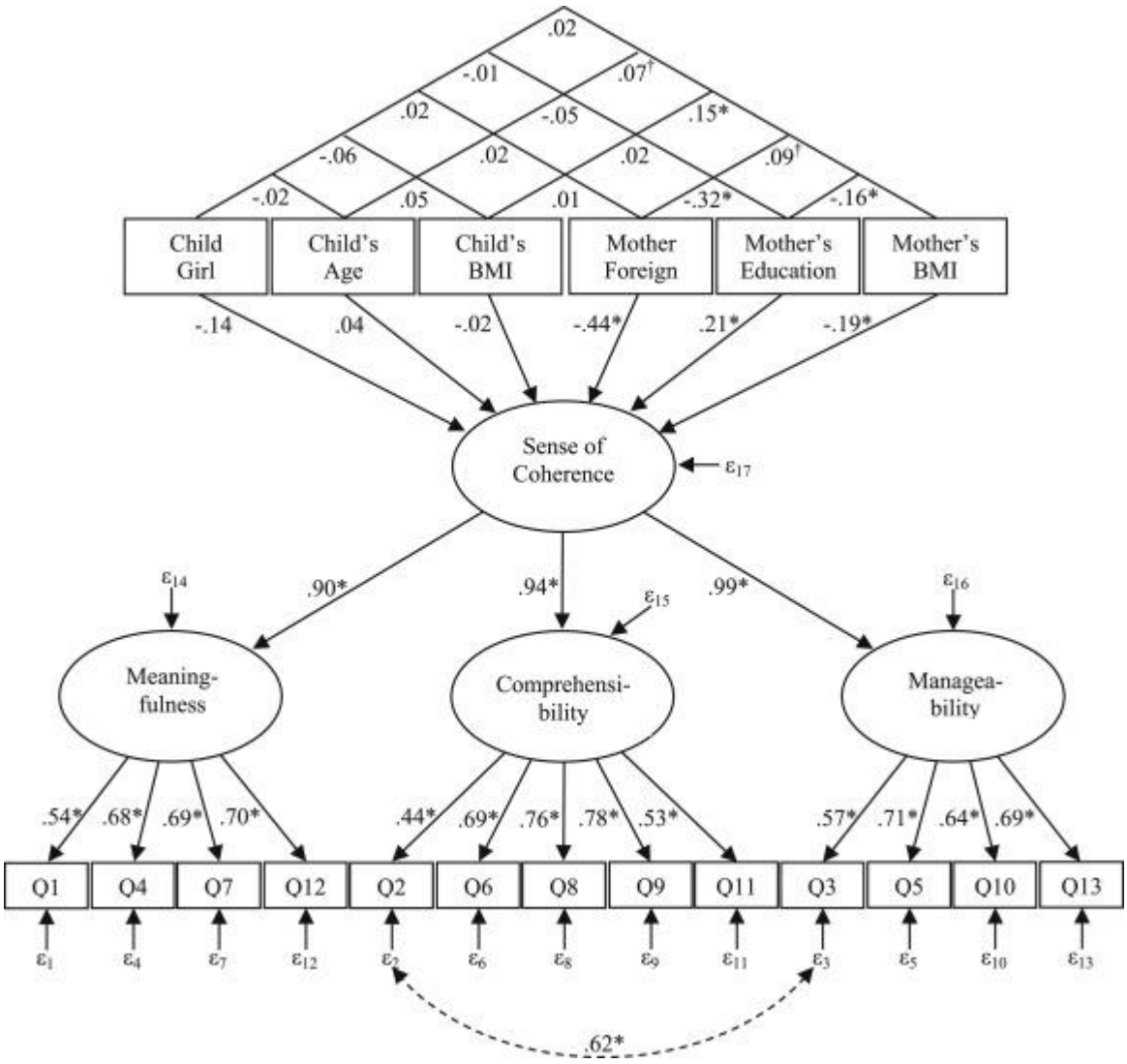

Fig. 1.
A structural equation model where meaningfulness, comprehensibility, and manageability are regressed on the second order factor sense of coherence which, in its turn, is regressed on child's and mother's characteristics.

3.3. Associations with parental feeding practices

In a second step, the direct and indirect (via concern) effects of sense of coherence on restriction, pressure to eat, and monitoring were included in the model (Fig. 2). These effects were adjusted for the effects of child's sex, child's age, child's BMI, mother's BMI, mother's foreign background, and mother's level of education. This model showed acceptable fit, $\chi^2(181) = 387$, $p < 0.001$; TLI = 0.898; CFI = 0.923; RMSEA = 0.036 (90% CI: 0.031–0.041); SRMR = 0.045. The analysis revealed that sense of coherence has a significant and negative direct, as well as total, effect on both restriction and pressure to eat. Sense of coherence also has a significant indirect effect on restriction via concern (Table 1). Sense of coherence can explain 4.6, 4.8, and 0% of the variance in restriction, pressure to eat, and monitoring, respectively.

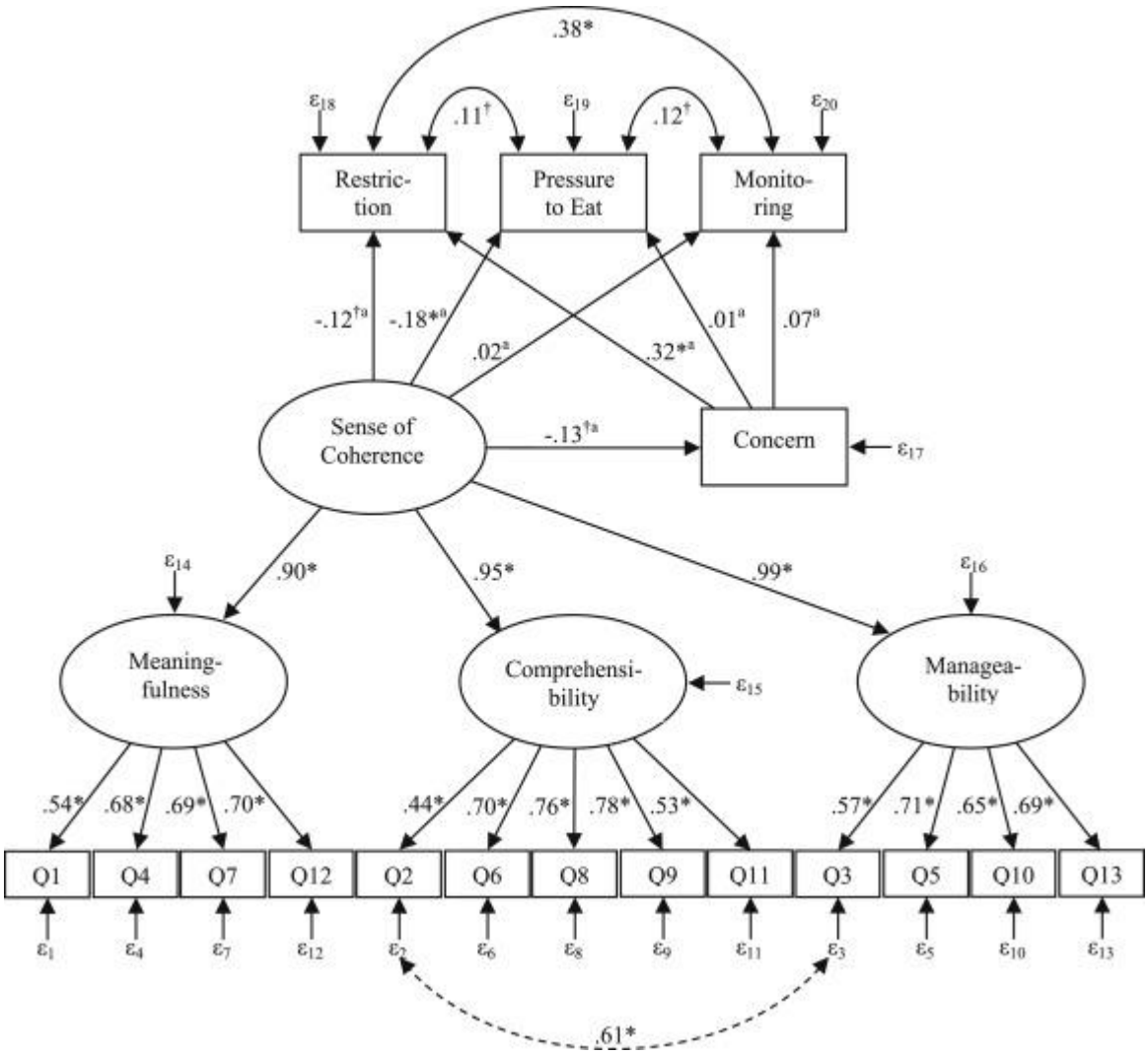

Fig. 2.
A structural equation model were meaningfulness, comprehensibility, and manageability are regressed on the second order factor sense of coherence which, in its turn, has a direct and indirect, via concern, effect on restriction, pressure to eat, and monitoring.

Table 1.
Total and indirect (via concern) effects of sense of coherence on restriction, pressure to eat, and monitoring. The effects are adjusted for the effects of child's sex, child's age, child's BMI, mother's BMI, mother's foreign background, and mother's level of education.

	Restriction			Pressure to eat			Monitoring		
	B	*SE*	%	*B*	*SE*	%	*B*	*SE*	%
Total	−0.157*	0.048	–	−0.184*	0.049	–	0.008	0.054	–
Via concern	−0.041†	0.018	26.1	−0.001	0.007	0.54	−0.009	0.007	–

*$p < .001$.
†$p < .05$.

4. Discussion

This study is the first, to our knowledge, to use SOC among parents of preschool-aged children in association with obesity-related factors, such as parental feeding practices. First, using CFA, our analysis demonstrated that the SOC-13 questionnaire is valid among mothers

of preschoolers. When SOC was regressed on background characteristics, the analysis found that SOC was influenced by the mothers' characteristics: sense of coherence increased with Swedish background and a higher level of education, and decreased with higher BMI. In our analysis of the SOC-13 and its associations with the CFQ among mothers of preschoolers in Sweden, we found that mothers who had a greater sense of coherence were less likely to engage in pressuring or restrictive feeding practices. Using SEM, our analysis demonstrated that SOC-13 scores had a negative direct effect on both restriction and pressure to eat, and an indirect effect on Restriction via concern. This suggests that resilience to stress may reduce the likelihood that mothers would engage in counterproductive practices, such as restrictive or pressuring feeding, even in the presence of concern about the child's weight.

4.1. Validity of the SOC

Before using a questionnaire in a new population, careful examination of its psychometricproperties, preferably with confirmatory factor analysis (which is a theory-driven rather than data-driven statistical approach) is necessary. Our validation has confirmed the construct validity and reliability of the SOC-13 in a large heterogeneous population of women in Sweden. Since Antonovsky's intention was to use the SOC questionnaire as a measurement of the whole, the analysis examines SOC as a total score, rather than each of the three factors separately (Antonovsky, 1993 and Eriksson and Lindstrom, 2005). The high correlations between the three factors showed that the factors were indeed related to each other. Additional proof for this was the strong internal consistency of the full scale (Cronbach alpha value of 0.89). In a systematic review of the validity of SOC-13, the internal consistency measured with Cronbach alpha ranged from 0.70 to 0.92 (Eriksson & Lindstrom, 2005); the Swedish version of the SOC-13 aligns with those studies that show the highest internal consistency. The fit was significantly improved by letting the error terms of items 2 and 3 correlate.

The high correlation between these two items "Has it happened in the past that you were surprised by the behavior of people whom you thought you knew well?" (on the Comprehensibility scale) and "Has it happened that people whom you counted on disappointed you?" (on the Manageability scale) may be due to the fact that the items occur after each other in the questionnaire. As both items have the same response options, the participant might be inclined to link the two. Further research is needed to assess the impact of question order of the correlation of these items.

4.2. SOC and socioeconomic status

The findings demonstrate that SOC is influenced by socioeconomic status (SES). Using mother's level of education as a proxy for SES, the analysis shows that SOC levels increase with education. Level of education, in turn, is negatively associated with mother's foreign origin and mother's BMI; these two variables are also negatively associated with SOC. This suggests that higher SES is associated with mothers' increased resilience to stress. This finding is in line with an earlier study in Sweden that found that poor parental SOC was more common in families of lower SES (Groholt et al., 2003).

The present study's findings – linking mothers' lower SES, migrant status, and higher BMI with lower SOC – can be contextualized within the literature on stress, obesity, and SES. Previous studies have identified chronic stress as a main driver of individual obesity, via metabolic and behavioral pathways (Brewis, 2014 and Dallman et al., 2003); at the population level, studies have implicated chronic stress as a mediator of associations between

lower SES and higher obesity rates (Everson et al., 2002 and Offer et al., 2010). From an early-life development perspective, maternal stress has been identified as a cause of decreased "metabolic capacity" in offspring, which may predispose offspring to obesity later in life – particularly in the presence of environmental, psychological, and economic stressors to which disadvantaged populations are more frequently exposed (Wells, 2010). The present study adds to this literature by exploring associations between SES, resilience to stress, and parenting practices. It assesses salutogenic orientations, rather than experiential stress, in order to examine sense of coherence as a potentially influential mediator of the relationships between chronic stress and obesity. In finding that mothers with lower SOC, and therefore less resilience to stress, are more likely to employ ineffective feeding strategies, the results suggest that parental SES and migrant status might influence children's eating behaviors and BMI via stress. Reduced resilience to stress, therefore, may be a potentially important factor in the cross-generational transmission of obesity within disadvantaged populations. Thus, from a public health perspective, the results suggest that programs targeting awareness of childhood obesity, nutrition education, and access to healthy foods among families and communities of lower SES should also include SOC-related parameters as part of the evaluation process, in order to improve program development and efficacy. Moreover, public health interventions should expand beyond parental education, to increase community-based capabilities and address the social inequalities that lead to increased rates of obesity among children of lower SES (Ulijaszek et al., 2016).

4.3. SOC and use of feeding practices

Our findings demonstrate that 4.6% of the variance in parental restriction of unhealthy foods – the parental feeding practice most linked to obesity in children – can be explained by parental level of SOC. Concern about child weight is negatively linked to SOC and positively linked to restriction; as much as 26% of the effect of SOC on restriction is mediated via concern. In other words, mothers with high levels of SOC, and thus greater resilience to stress, are less likely to express concern about their child's weighing too much or eating unhealthy foods. Accordingly, mothers with high levels of SOC are also less likely to use restrictive feeding practices – practices which, when excessive, constitute a counterproductive reaction to concern about child weight. Unlike previous studies that found associations between restrictive feeding practices only and mothers' symptoms of anxiety, depression, or parental dissatisfaction (Haycraft et al., 2013 and Mitchell et al., 2009) this study has demonstrated that maternal sense of coherence is associated with both restrictive feeding practices and pressure to eat. The association between SOC and restrictive feeding practices is especially important, however, as restrictive feeding is the practice most often linked to children's overweight (Clark et al., 2007 and El-Behadli et al., 2015).

Parental recognition of overweight and obesity in young children is an important part of childhood obesity prevention and intervention (Gerards, Dagnelie, Jansen, De Vries, & Kremers, 2012). Such recognition, however, may lead parents to feel concerned and employ counterproductive strategies, like restrictive feeding, in order to manage their child's weight. Children exposed to restrictive feeding develop greater appetite for foods designated as 'forbidden' (Fisher and Birch, 1999a, Fisher and Birch, 1999b and Jansen et al., 2007), whereas children who are pressured to eat certain foods develop an aversion to these foods (Galloway, Fiorito, Francis, & Birch, 2006). Parental restriction, moreover, has been linked to children's gaining weight over time, especially among girls (Birch and Fisher, 2000 and Faith et al., 2004), although some studies have not found such associations (Rifas-Shiman et al., 2011), potentially due to differences in child temperament or appetite (Hittner et al., 2016 and Rollins et al., 2014). Additionally, excessive weight talk by family members

can lead to enduring body image problems, unhealthy eating, and further weight gain (Eli et al., 2014 and Neumark-Sztainer et al., 2010). An overall goal of effective childhood obesity interventions, then, is to decrease parents' employment of restrictive feeding and to promote effective strategies such as parental modeling, covert control (Burrows et al., 2010, Daniels et al., 2013 and Daniels et al., 2012), and limit setting (Rollins et al., 2015). This study's results demonstrate that mothers who have higher levels of resilience to stress are less likely to employ restrictive feeding. The results, then, suggest that mothers who have higher resilience levels may be more likely to use positive strategies such as limit setting to influence children's weights and eating practices. This links with Antonovsky's argument that people who have high SOC levels have a greater capacity to recognize and use 'general resistance resources (GRR)' – both internal (person-based) and external (environment-based) – in coping with stress (Antonovsky, 1979). Therefore, mothers with higher SOC levels may be better positioned to utilize available resources creatively, such that they do not need to resort to strategies like restrictive feeding when coping with children's overweight. Moreover, mothers with higher SOC levels may be more confident in their parenting practices, and more likely to rely on their parenting perspectives in making feeding decisions – an attitude that may be effective, long-term, in preventing obesity-related eating behaviors (Rollins et al., 2014 and Rollins et al., 2015). Further research is needed in order to identify and assess associations between mothers' SOC and use of available resources to manage children's eating practices.

4.4. Clinical implications

The findings suggest that childhood obesity prevention and intervention programs would benefit by integrating SOC-related parameters into their implementation and evaluation processes, in order to improve program development and efficacy. Prevention and intervention programs raise parental awareness about childhood obesity, and may therefore increase parents' sense of concern over their children's weights. To our knowledge, research studies have yet to examine how to reduce parental concerns about child weight in order to discourage restrictive feeding. Our findings suggest that bolstering parental SOC may be an effective way to reduce parental concern and use of restrictive feeding. Increasing SOC through intervention programs could be an indirect strategy with a 'positive message' for parents, one that helps empower them in making health behavior changes, and improves their management of specific, stressful feeding situations. As the findings demonstrate that parents of lower SES or foreign background are more likely to have lower sense of coherence, it is probable that these parents would face additional barriers in coping, such as economic hardship or lack of social resources. Thus, when delivering childhood obesity prevention and intervention programs to lower SES or migrant families, these additional barriers should be acknowledged and sensitively discussed in SOC building exercises.

Furthermore, during consultations with individual parents or families, clinicians should ask parents what kind of support is available to them. Social support improves SOC (Wolff & Ratner, 1999), while lack of social and emotional support decreases SOC (Nilsson, Holmgren, & Westman, 2000). Parents of preschool-aged children often experience increased stress levels (Ahlborg et al., 2013), but financial, emotional, and practical support from extended family members, such as grandparents, may help parents manage everyday stressors and thus enable them to make better feeding choices (Lindberg et al., 2015). We therefore suggest that clinicians use the clinical encounter to identify parents who do not have support from their extended family, and to help those parents find and decide on ways to utilize resources in their wider community circles. Clinicians should thus actively seek up-to-date information about the community resources available in their catchment areas, such as

parents' groups, children's playgroups, extended childcare, and parenting and healthy feeding classes.

4.5. Strengths and limitations

The study's main strength was the size and heterogeneity of the sample: nearly 600 mothers, representing 64 countries of origin, completed the questionnaire. The study's main limitation was the survey's reliance on self-reported heights and weights for BMI calculations. As in other large surveys (Akinbami and Ogden, 2009, Bloom et al., 2003 and Dey et al., 2004), operational and economic reasons precluded expert measurement of participant weights and heights, and the authors recognize that this strategy is often subject to inaccuracies (Himes, 2009 and Huybrechts et al., 2011). Notably, however, at 4 years of age, 90% of children in Sweden receive a voluntary health check-up, sponsored by the government. Height and weight measures, performed by nurses, are part of the check-up, such that parents of 4-year-olds might have recently-acquired, accurate data. The second limitation was the survey's sole focus on women respondents. Although mothers are undoubtedly central to young children's feeding (Nowicka et al., 2014), 4-year-olds have important relationships with other adult caretakers, and a deeper understanding of parental feeding practices can be gained by considering not only mothers' concerns over child weight, but also children's eating behaviors (Jansen et al., 2012), appetite (Llewellyn, van Jaarsveld, Johnson, Carnell, & Wardle, 2010), and temperament (Bergmeier et al., 2014a, Bergmeier et al., 2014b and Faith and Hittner, 2010). However, the two previous studies most similar to ours (Haycraft et al., 2013 and Mitchell et al., 2009) have also included mothers only, such that limiting the sample to women respondents allows a more direct comparison of findings across these studies. Another limitation is the survey's response rate (65%), which suggests that the sample might have been subject to self-selection bias; however, given the survey's target participant population (all women named as guardians of 4-year-old children in one city), systematic differences between the sample and the general population it represented could not be identified. It is also important to point out that a response rate of approximately 60% is common in this type of study in Sweden and elsewhere (Asch et al., 1997, Hager et al., 2003 and Rosvall et al., 2008). A final limitation is posed by the data's cross-sectionality, which precludes determining whether child BMI affects restrictive feeding practices, or vice versa.

4.6. Conclusions

This study was the first to analyze associations between sense of coherence (measured through the SOC-13) and parental feeding of preschool-aged children (measured through the CFQ) among mothers of preschoolers in Sweden. The analysis validated the SOC-13 in this population, and found significant associations between SOC and controlling feeding practices. Specifically, the analysis found that mothers who had a higher sense of coherence were less likely to engage in pressuring or restrictive feeding practices; these mothers were also less likely to express concern about their children's weights or eating behaviors. The results, therefore, suggest that mothers with higher sense of coherence may have greater capacity to cope with young children's weight- and eating-related issues, without resorting to the often-ineffective strategies of pressuring or restrictive feeding. This suggests that childhood obesity prevention and intervention programs might benefit by integrating SOC-related parameters into their implementation and evaluation processes, in order to improve program development and efficacy. As the analysis also found that mothers of lower SES or foreign origin were more likely to have a lower sense of coherence, childhood obesity

programs should particularly attend to SOC among lower SES and migrant parents, while addressing the structural barriers that these parents face in building resilience to stress.

Author contributions

PN conceived of the study, collected data, designed the statistical approach together with KE and KS and supervised the coordination of the study and manuscript process. KE interpreted data and wrote the manuscript. KS performed the statistical analyses and contributed to the writing of the manuscript. LM, AP, CEF and MSF made a substantial contribution to conception and design, and to interpretation of data. All authors read and approved the final manuscript and are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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