

The Role of Care Neglect and Supervisory Neglect in Childhood Obesity in a Disadvantaged Sample

John F. Knutson, PhD, Sarah M. Taber, MA, Amanda J. Murray, MA, Nizete-Ly Valles, BS and Gina Koeppel, PhD
The University of Iowa

Objective Assess the roles of care neglect and supervisory neglect, and the moderating influence of child age on childhood obesity. **Study Design** Child BMI, parental care neglect, and supervisory neglect were assessed in an ethnically diverse sample of 571 young children from two Midwestern States. Hierarchical linear regression was used to assess the influence of both forms of neglect and the moderating role of age. **Results** Fifteen percent of the children were overweight and 16.3% were obese. Care neglect significantly correlated with child BMI for younger but not older children, while supervisory neglect significantly correlated with child BMI for older but not younger children. **Conclusions** The impact of two types of neglect on obesity varied across age, highlighting the importance of differentiating between types of neglectful parenting when addressing the high rate of childhood obesity in disadvantaged children.

Key words age moderation; body mass index; care neglect; disadvantaged children; supervisory neglect.

Prevalence rates of childhood obesity have evidenced a marked increase in the United States and globally (Cornette, 2008). Although obesity itself can be problematic for children's health, it also has been implicated as a risk factor in children and adolescents for problems that include stigmatization, impaired health, low self-esteem, poor quality of life, psychological distress, and suicidal ideation (Adams & Bukowski, 2008; Cornette, 2008; Hebebrand & Herpertz-Dahlmann, 2009). Though genetic and hormonal conditions can predispose some children to obesity, factors such as diet and physical activity play a substantial role in determining children's weight. Recent increases in the rates of childhood obesity are taken as evidence of the impact of environmental factors on childhood weight gain (Hebebrand & Hinney, 2009). Although there has been considerable discussion of potential environmental contributors to childhood obesity, most of the possible contributors have not yet been thoroughly researched. Among the possible factors that could contribute to childhood obesity are deficient parenting and maltreatment (c.f. Gilbert et al., 2009).

A number of lines of evidence have implicated neglectful parenting as a factor in childhood obesity. An early

study by Christoffel and Forsyth (1989) detailed the life circumstances of 12 severely obese pediatric patients and noted that their family environments were characterized by disorganization, separation of mother and child, displacement of child care, parental denial of the child's weight problem, and inconsistent medical follow-up, all facets of care that are often subsumed under considerations of neglect in the child maltreatment literature (c.f. Dubowitz, 2006; Knutson & Schartz, 1997; Trocmé, 1996). Although describing those family attributes as probable contributors to obesity, the Christoffel & Forsyth (1989) study did not have any comparison conditions. Recent studies provide evidence that neglect and sexual abuse, but not physical or emotional abuse, are associated with an increased risk of obesity in childhood and young adulthood (Noll, Zeller, Trickett, & Putnam, 2007; Whitaker, Phillips, Orzol & Burdette, 2007). Although the Whitaker et al. (2007) study was based on a large sample, the index of neglect was limited to five items from a self-report scale. Other evidence consistent with the hypothesized link between neglectful parenting and obesity comes from retrospective studies of childhood experiences among adults presenting with obesity (Williamson, Thompson, Anda, Deitz, &

All correspondence concerning this article should be addressed to John F. Knutson, E11 Seashore Hall, Iowa City, IA 52242, USA. E-mail: john-knutson@uiowa.edu

Journal of Pediatric Psychology 35(5) pp. 523–532, 2010
doi:10.1093/jpepsy/jsp115

Advance Access publication December 8, 2009

Journal of Pediatric Psychology vol. 35 no. 5 © The Author 2009. Published by Oxford University Press on behalf of the Society of Pediatric Psychology. All rights reserved. For permissions, please e-mail: journals.permissions@oxfordjournals.org

Felitti, 2002), and a prospective study from Denmark in which teacher and school nurse ratings of childhood neglect predicted obesity in young adulthood (Lissau & Sorensen, 1994). This latter finding is similar to a recent prospective study in which sexual abuse was implicated in young adult obesity, but not obesity earlier in development (Noll et al., 2007). If neglect were related to the development of obesity, the high prevalence rate of neglect [Office of Human Development Services (OHDS), 1981, 1988; Sedlak & Broadhurst, 1996; U.S. Department of Health and Human Services, Administration on Children, Youth, and Families, 2001, 2002] would suggest it could be a major factor to consider in efforts to address childhood obesity.

Neglect is commonly described as a circumstance wherein parental inaction or inattention results in harm to a child, or a circumstance where the basic needs of a child are not met (Polansky, Hally & Polansky, 1975). Because so many different events can be subsumed under such a broad definition, researchers have offered various taxonomies of neglect (c.f. Giovannoni, 1985; Hegar & Yungman, 1989; Sedlak & Broadhurst, 1996; Trocmé, 1996) that could be used to clarify exactly how circumstances of neglect are associated with distinct child outcomes. Recently, Knutson, DeGarmo, & Reid (2004) and Knutson, DeGarmo, Koepl, & Reid (2005) argued for a theoretical model that distinguished between care neglect and supervisory neglect and provided empirical evidence that these two forms of neglect contributed, as independent factors, to the development of young children's aggression. In those studies, care neglect included such conditions as poor hygiene, exposure to household environmental hazards, and inadequate health care. Supervisory neglect was conceptualized as parental lack of awareness of child activities, personal preferences, and the child's engagement in risky or deviant behaviors. Either form of neglect could contribute to childhood obesity, albeit through somewhat different processes.

Parents evidencing supervisory neglect may contribute to their child's obesity by failing to adequately monitor their child's physical activities and ingestive behaviors and by failing to exert an influence on both activity and eating habits. Parents may also contribute to their child's obesity via care neglect by failing to ensure the provision of appropriate nutrition and health care. Because the Whitaker et al. (2007) study implicated neglectful parenting in the obesity of preschool children, and other studies seem to suggest the impact could be delayed in school age children (Lissau & Sorensen, 1994), it is possible that the impact of both forms of neglect would be a function of the age of a child, especially when age differences reflect

important differences in development and extrafamilial influences. Thus, in examining the putative links between care neglect or supervisory neglect and childhood obesity, it is important to consider the moderating influence of a child's age, particularly when samples span periods of significant developmental change.

The present study was designed to examine the impact of Care Neglect and Supervisory Neglect on childhood obesity. Because both neglect and obesity are exacerbated by poverty and limited access to resources [NIS; Office of Human Development Services (OHDS), 1981, 1988; Sedlak & Broadhurst, 1996; Swinburn, 2009] the present study assessed the relation between the two forms of neglect and obesity within a sample of children living in circumstances of disadvantage. Additionally, with sexual abuse implicated in the development of obesity (Noll et al., 2007) the present study was conducted with a sample in which children known to have been sexually abused were excluded from the sample. It was hypothesized that younger children (preschool and kindergarten) may be more susceptible to care neglect. In contrast, parental supervision may become a more significant factor as children develop, engage in more contexts outside the home, and begin to evidence greater degrees of independence. Thus, it was hypothesized that the early school-aged children (first grade and up) in the sample would be more susceptible to supervisory neglect.

Methods

Subjects

The 571 participating socially disadvantaged children, and their parent(s), had been enrolled in two ongoing studies of parenting and children's social development. The children were recruited from two counties in southeastern Iowa ($n = 389$) and a single county in north central Wisconsin ($n = 182$). The resulting sample was diverse with respect to degree of urbanization as well as ethnic and racial composition. The children in the sample were described by their parent as 61.6% White (non-Hispanic), 19.4% Black, and 19% as members of other racial or ethnic groups (Latino/a, Multi-ethnic/Multiracial, Native American, Asian/Pacific Islander). Ages ranged from 3 years 7 months to 9 years 6 months ($M = 6$ years 3 months, $SD = 17.3$ months), and the sample of children was 50.6% male. Mothers were self-described as 69.9% White (non-Hispanic), 19.8% Black, and 10.2% as members of other racial or ethnic groups (Latina, Multi-ethnic/Multiracial, Native American, Asian/Pacific Islander). Although disadvantaged, mothers evidenced a range of occupations and educational attainment.

Families were eligible to participate in the two longitudinal studies if they received any form of service from their state or county social service agency during the three months preceding enrollment. Children who had been identified as neglected or physically abused were eligible to participate in both projects, although those who were in an out-of-home placement, who were known to have been sexually abused, or who were actively enrolled in intensive interventions related to parenting were not eligible. The second project was also designed to enroll families in which domestic violence had occurred. Because exposure to domestic violence constitutes neglectful parenting in Iowa and Wisconsin, families enrolled in the first project could also have been characterized by domestic violence. Thus, participants from both projects were drawn from essentially the same high-risk population. Comparisons between the samples did not identify any differences with respect to demographic variables or any core variables in this report.

The informed consent and enrollment in both projects occurred during an in-home interview with the parent; all other variables were assessed in subsequent laboratory sessions. Mothers were compensated \$50 per session and children could select a toy valued at \$10 or \$10 cash. The projects were conducted under the aegis of The University of Iowa Institutional Review Board (IRB) and Certificates of Confidentiality. The protocol explicitly precluded informing the social service agencies whether families elected to enroll in the project. Thus, there were no social-service inducements to participate. Because of the complexity of the recruitment process it is impossible to determine unequivocally the number of eligible subjects who were actually contacted (i.e., read the recruitment letters). Indirect evidence derived from telephone contacts, returned letters, and focus groups with the targeted population suggests that ~50% of eligible families were actually contacted and ~50% of contacted families scheduled an initial home visit. Less than 1% of those scheduling an in-home recruitment visit declined to participate. Some of the subjects participating in the current study were described in Knutson et al. (2005), DeGarmo, Reid, & Knutson, (2006), Knutson, Lawrence, Taber, Bank, & DeGarmo (2009), and Valles & Knutson, (2008).

Procedure

Initial face-to-face contact with the mother occurred during an ~90-min appointment in the home, where informed consent was obtained. Immediately following the informed consent process a structured interview regarding the

circumstances of the child's life, family background, and living conditions was conducted. This structured interview was based, in part, on a modification of the Home Observation for Measurement of the Environment (HOME: Caldwell & Bradley, 1978; Leventhal, Selner-O'Hagan, Brooks-Gunn, Bingenheimer & Earls, 2004), and, in part, on the framework that emerged from the recommendations of the Research Sub-Committee of the Interagency Task Force on Child Abuse and Neglect (Sternberg et al., 2004). The interview included questions related to injury prevention (c.f. Peterson, Ewigman, & Kivlahan, 1993) and home safety (Tymchuk, Lang, Dolyniuk, Berney-Ficklin & Spitz, 1999). Because the interview occurred in participants' homes, it was possible to directly assess circumstances of neglect, including sleeping arrangements, cleanliness, plumbing, personal hygiene of family members, and any hazards threatening children in the household. During the first laboratory session, typically scheduled within 10–15 days of the in-home visit, the child's height was measured within 0.5 inches and clothed-weight was obtained. The mother and child also participated in a structured parent-child interaction, and each completed a number of standardized psychological instruments, most of which do not pertain to the current report. More detailed descriptions of the protocols and procedures can be found in Knutson et al. (2005), DeGarmo et al. (2006), Shay & Knutson (2008), and Valles & Knutson (2008).

Measures

Home Environment Questionnaire

The Home Environment Questionnaire (HEQ; Laing & Sines 1982; Sines, Clarke, & Lauer, 1984) is a psychometrically reliable true/false questionnaire that uses objectively phrased items to obtain information about the child's environment from the child's parent. Developed using the rational-statistical approach (c.f. Loevinger, 1956), the HEQ has eight empirically derived scales measuring dimensions of a child's environment that are theoretically relevant for the expression of deviant and nondeviant child behaviors (Murray & Sines, 1996). The Achievement scale measures family conditions that model or provide support for achievement on the part of the child. The Socioeconomic Status scale is comprised of items that refer to activities and attitudes related to academic and intellectual pursuits, as well as participation in community affairs. These two scales have been effectively combined with maternal occupational and educational attainment in an index of family social disadvantage (Knutson et al., 2005) within economically disadvantaged samples.

Mothers' *T*-scores on the HEQ Achievement subscale ranged from 23 to 72 ($M = 46.1$, $SD = 9$), and the Socioeconomic Status subscale scores ranged from 29 to 86 ($M = 51.8$, $SD = 9.6$).

Care Neglect

The multisource measure of care neglect (Knutson et al., 2005) consisted of a 56-item summative index that was derived, in part, from the in-home interview and reflected both parent report and objective observer ratings of care neglect (e.g., child does not have a toothbrush, has not had a routine medical or dental examination in over 12 months), and household environmental conditions that would occasion social (household is overly crowded; inadequate illumination; inadequate furniture) and physical risks to a child (unsafe stairs; inadequate plumbing; animal feces present; accessible pharmaceuticals). Proximal circumstances outside the home that could occasion direct risk to the child that were observed during the home visit (e.g., broken glass, drug paraphernalia) were also included in the Care Neglect Index. Items were all scored in a direction to indicate neglect and summed. The obtained total Neglect Index scores ranged from 4 to 24 ($M = 11.8$, $SD = 3.6$).

Supervisory Neglect

As noted by Dishion and McMahon (1998) awareness of child activities is a critical component of parental supervision. Thus, for the young children of the present study, the construct of supervision was measured by parental awareness of child activities reflected in congruence between parent report and child report. Based on the work of Knutson et al. (2005) two concordance scores were derived to measure effective supervisory skills of the parent. The first index was the correspondence between child report and parent report on the Children's Reinforcement Survey Schedule (RSS; Clement & Richard, 1976). The RSS, administered by interview, asks children to identify the people with whom they spend the most time, their favorite foods, toys they use most often, activities in which they frequently engage, and the places they spend the most time. They are also asked to identify toys they don't have but would like, places they would like to spend more time, additional activities in which they would like to participate, and people with whom they would like to spend more time. The parent completes a paper and pencil RSS form which contains the same categories as the child version. Hall (1986) used the effective agreement for occurrence statistic between the child report and the parent report on the RSS as a single index of supervision in a study of the development of externalizing disorders in young

children. In the present study, based on the work of Hall (1986), the RSS concordance score ($M = .37$, $SD = .09$) was used as an index of the parents' awareness of the more routine aspects of their child's life.

As a second indicator of supervision, more related to deviant behavior or developmentally risky acts, the parent and the child independently completed The Children's Experience and Excitement Scale (CEES; Selner, 1992; Selner & Knutson, 1990). The CEES consists of 44 slides depicting children engaging in a range of activities. To minimize sex role responding there is one form for boys, with male actors, and another form for girls, with female actors. In an interview format, child subjects are asked whether they have ever engaged in the activity depicted in the slide. If they had not engaged in the activity, they were asked whether they had the opportunity to do so. Parents complete the CEES in a self-report format by indicating whether their child has ever engaged in the pictured activity and whether they would allow their child to engage in the pictured activity. Concordance between child and parent reports of experienced activities across slides provides the second indicator of supervision. Complementing the RSS-based measure of routine activities, the CEES concordance measure provides an indicator of the parent's awareness of their child engaging in frankly deviant acts or developmentally inappropriate activities. The index ranged from 12 to 42 agreements ($M = 31.8$, $SD = 4.3$).

Parent-child concordance scores from the CEES and RSS were significantly, albeit modestly, correlated ($r = 0.17$, $p < .01$). Because Knutson et al. (2005) and the DeGarmo et al. (2006) successfully used a factor-analytical combination of the CEES and RSS concordance scores and documented the utility of this approach to studying supervision, the two scores were combined using principal components factor analysis to create an overall Supervisory Neglect score.

Results

Childhood Obesity

Body mass index (BMI) scores and age-based BMI percentile scores were derived using the Centers for Disease Control and Prevention (CDC) SAS program for calculating 2000 Growth Chart scores (Ogden et al., 2002). Children's BMI scores ranged from 7.75 to 37 ($M = 16.7$, $SD = 3.06$). Based on the CDC growth charts and recommendations for the identification of outliers, two children were identified as extremely low BMI outliers and were excluded from the analyses. This resulted in BMI scores ranging from 11.6 to 37 ($M = 16.7$, $SD = 3.03$; $n = 569$). Age adjusted

percentile scores for BMI were also calculated. Based on the recommendations of the Expert Committee on Pediatric Obesity (Barlow and the Expert Committee, 2007), children in the age-based 84–95th percentile can be classified as overweight and at risk for obesity, while those ≥ 95 th percentile are classified as obese. Based on these classifications, 14.9% of the sample was within the at-risk range, while 16.3% would be considered obese. These findings are consistent with previous research demonstrating that rates of obesity can surpass rates of risk for obesity in disadvantaged samples (Ogden et al., 2002; Lacar, Soto, & Riley, 2000). The rate of obesity in the present sample was approximately three times the CDC Growth Chart norms and the combined rate of obese and overweight children was approximately twice that which could be expected from the Growth Chart norms. Bivariate correlations between the BMI, demographic variables, and the indices of neglect were low ($< .10$), not statistically significant, but consistent with the hypothesized moderated processes.

Care Neglect

The link between the Care Neglect Index and BMI percentile scores was assessed in a hierarchical linear regression designed to determine the moderating role of child age. Although the sample was entirely economically disadvantaged, because social status has been strongly linked to both neglect (Sedlak & Broadhurst, 1996) and childhood obesity (Swinburn, 2009), a derived social status factor score (principal components extraction) comprised of the two HEQ subscales and the mother's education and occupational attainment was calculated. Education was scaled to range from 1 "never reached high school" to 8 "graduate/professional degree" and occupation was scaled to range from 1 "unskilled laborer" to 7 "professional." This social status factor score was then entered into the regression model as a control variable. In addition, all main effects were centered prior to conducting the regression analysis with the interaction terms. Results of this regression analysis are summarized in Table I. Social status was not significantly related to child BMI percentile. The two-way interaction of Age and Care Neglect emerged as significant in the initial regression and remained significant in the tested reduced model that included only the two main effects and the interaction ($N = 567$). Follow-up tests of the interaction were conducted to determine the nature of significant moderation effects following recommendations of Cohen and Cohen (1983) and Holmbeck (2002). Regression slopes depicting the association between child BMI and Care Neglect Index scores were examined at levels of the moderator (Age) both 1 SD

Table I. Summary of Regression Analysis Examining Age as a Moderator of the Relation between Care Neglect and Child BMI Percentile ($N = 514$)

Variable	<i>B</i>	<i>SE B</i>	β	<i>t</i>
Step 1				
Social Status	-.92	1.84	-.02	-.50
Step 2				
Child's Age	.12	.09	.06	1.38
Step 3				
Care Neglect	.49	.42	.05	1.17
Step 4				
Age \times Social Status	.03	.11	.01	.26
Age \times Care Neglect	-.06	.03	-.10	-2.22*
Social Status \times Care Neglect	.90	.51	.08	1.78
Step 5				
Age \times Social Status \times Care Neglect	.05	.03	.07	1.60

$R^2 = .00$ for Step 1; $\Delta R^2 = .00$ for Step 2; $\Delta R^2 = .00$ for Step 3;

$\Delta R^2 = .01$ for Step 4; Final $R^2 = .03$.

* $p < .05$.

Table II. Summary of Regression Analysis Examining Age as a Moderator of the Relation between Supervisory Neglect and Child BMI Percentile ($N = 504$)

Variable	<i>B</i>	<i>SE B</i>	β	<i>t</i>
Step 1				
Social Status	-1.78	1.9	-.04	-.93
Step 2				
Child's Age	.14	.09	.07	1.54
Step 3				
Supervisory Neglect	-2.32	3.02	-.04	-.77
Step 4				
Age \times Social Status	.10	.12	.04	.84
Age \times Supervisory Neglect	-.27	.17	-.07	-1.58
Social Status \times Supervisory Neglect	1.76	3.60	.02	.49
Step 5				
Age \times Social Status \times Supervisory Neglect	-.04	.20	-.01	-.19

$R^2 = .00$ for Step 1; $\Delta R^2 = .00$ for Step 2; $\Delta R^2 = .00$ for Step 3; $\Delta R^2 = .01$ for Step 4; Final $R^2 = .02$.

above and below the mean. Care Neglect was significantly associated with BMI for younger children (standardized $\beta = .17$, $p < .01$, $t = 2.8$) but not older children (standardized $\beta = -.03$, $p = .65$, $t = -.45$).

Supervisory Neglect

The link between Supervisory Neglect and BMI percentile scores was assessed using an identical analytic method, controlling for social status with the derived factor score. The results of the regression are summarized in Table II. Based on the nonsignificant results of the initial regression

Table III. Summary of Regression Analysis Examining Age as a Moderator of the Relation between RSS Supervision Score and Child BMI Percentile ($N = 508$)

Variable	<i>B</i>	<i>SE B</i>	β	<i>t</i>
Step 1				
Social Status	-1.78	1.85	-.04	-.96
Step 2				
Child's Age	.12	.09	.07	1.44
Step 3				
RSS	-12.86	16.28	-.04	-.79
Step 4				
Age \times Social Status	.07	.11	.03	.61
Age \times RSS	-2.09	.95	-.10	-2.20*
Social Status \times RSS	13.43	20.72	.03	.65
Step 5				
Age \times Social Status \times RSS	.34	1.09	.02	.32

$R^2 = .00$ for Step 1; $\Delta R^2 = .00$ for Step 2; $\Delta R^2 = .00$ for Step 3; $\Delta R^2 = .01$ for Step 4; Final $R^2 = .02$.

* $p < .05$.

using the Supervisory Neglect factor score, an alternate analysis of supervisory neglect was considered. This decision was based, in part, on the modest correlation between the CEES and RSS congruence scores and, in part, on the leptokurtic and positively skewed congruence scores between parent-child reports on the CEES, resulting in a relatively restricted range of CEES congruence scores and a limited contribution to the overall Supervisory Neglect score. Additionally, although this combined Supervision score was effectively used in testing models pertaining to children's aggression (Knutson et al., 2005), the more deviant behaviors represented in the CEES might not pertain to supervision relevant to ingestion and general physical activity. Thus, two alternative regression analyses were conducted to examine a possible relation between different age-moderated scores of supervisory neglect and child BMI: one using the congruence scores derived from the RSS and one using the congruence scores derived from the CEES (Tables III and IV). As expected, based on the distributional characteristics of the sample, the CEES congruence scores were not related to BMI percentile scores. However, in the parallel regression analysis, the two-way interaction between Age and the RSS emerged as statistically significant and remained significant in the tested reduced model ($N = 549$) including only the two main effects and the interaction. Follow-up tests examining the nature of the significant interaction demonstrated that supervision, as measured by RSS congruence scores, was significantly related to BMI percentile scores for older children (standardized $\beta = -.13$, $p = .03$, $t = -2.2$) but not younger children (standardized $\beta = .06$, $p = .33$, $t = .97$).

Table IV. Summary of Regression Analysis Examining Age as a Moderator of the Relation between CEES Supervision Score and Child BMI Percentile ($N = 509$)

Variable	<i>B</i>	<i>SE B</i>	β	<i>t</i>
Step 1				
Social Status	-1.82	1.87	-.05	-.97
Step 2				
Child's Age	.11	.09	.06	1.24
Step 3				
CEES	.07	.359	.01	.21
Step 4				
Age \times Social Status	.11	.11	.05	1.0
Age \times CEES	.00	.02	.01	.15
Social Status \times CEES	-.22	.42	-.03	-.52
Step 5				
Age \times Social Status \times CEES	-.02	.03	-.04	-.78

$R^2 = .00$ for Step 1; $\Delta R^2 = .00$ for Step 2; $\Delta R^2 = .00$ for Step 3; $\Delta R^2 = .00$ for Step 4; Final $R^2 = .01$.

Discussion

The present study was designed to evaluate the putative link between neglectful parenting and childhood obesity. Moderation analyses yielded support for the hypothesis that care neglect was significantly associated with age-based BMI percentile scores in younger but not older children. Although these findings are limited by their correlational nature, they do suggest that failing to adequately provide for a child's basic needs may have more detrimental effects in younger (i.e., preschoolers and kindergarteners) rather than older children (i.e., 6- to 9-year-olds), at least with respect to concurrent obesity. In the current study, the Care Neglect Index was based on a multi-method/multisource approach and included both circumstances within direct parental control (e.g., child has no toothbrush) and environmental conditions (unsafe stairs, broken glass) that might be the responsibility of another party. As noted by Dubowitz (2006), neglect must be defined in terms of events that impinge on the child rather than being limited by who bears the responsibility for those events. Thus, a directly assessed broad-based index of neglect was related to concurrent obesity in younger children, all of whom were from circumstances of disadvantage. The lack of an association between care neglect and obesity in older children is consistent with the findings of Lissau and Sorensen (1994). Specifically, they failed to demonstrate a relation between childhood obesity and neglect in a sample of 9- to 10-year-olds, although childhood neglect did correlate with obesity in young adulthood. Because the present study is limited by correlational data and concurrent indices of obesity and neglect, prospective longitudinal studies

are needed to clarify the link between care neglect and obesity, and those studies should represent a broad age range of children who might be differentially vulnerable to specific aspects of parenting.

The finding that care neglect is associated with elevated BMI scores in young children can be seen as consistent with the case-study material provided by Christoffel and Forsyth (1989), and the study by Whitaker et al. (2007). However, the Whitaker et al. study used the 5-item Neglect Scale from Parent–Child Conflict Tactics Scale (Straus, Hamby, Finkelhor, Moore & Runyan, 1998) to assess neglectful parenting; those few items assess components of care neglect, supervisory neglect, and even parental substance abuse. Thus, the specific parental deficiencies that may contribute to childhood obesity are not clearly delineated and it is impossible to determine whether the current care neglect findings are truly consistent with the Whitaker et al. findings, or whether the Whitaker et al. findings might represent other features of neglect. It is also important to note that emerging evidence has linked child sexual abuse to later obesity. To the extent that sexual abuse covaries with other forms of child maltreatment (c.f. Sullivan & Knutson, 1998, 2000), it is important to attempt to parse the links between various forms of child maltreatment and poor child outcomes. In the present study, children known to have been sexually abused were not eligible for participation. Although children whose sexual abuse was unknown at the time of enrollment may have participated, the base rate of sexual abuse is known to be low in the present study. In the Whitaker et al. study, child sexual abuse was not measured in the birth cohort that was used, and it is unknown whether co-occurring sexual abuse could be a factor in that research.

To examine whether supervisory neglect was associated with childhood obesity, the first analysis used a supervision factor score that had been used in earlier work (DeGarmo et al., 2006; Knutson et al., 2005). Although the overall Supervisory Neglect factor score did not correlate with child BMI percentiles, the parent–child concordance score based on the RSS was related to concurrent BMI in the age-moderation analyses. The RSS concordance score reflects parental awareness of the more routine aspects of their child’s life and incorporates information relevant to ingestive behavior. Because awareness of child activities, persons with whom they associate, and places they spend time is a prerequisite for effective supervision, the RSS concordance index should tap domains of child behavior that are related to ingestion and exercise. Thus, although this analysis was post hoc, the age-moderated findings are consistent with theoretical

and empirical considerations of the role of supervision (Dishion & McMahon, 1998) and Hall’s (1986) use of the RSS congruence score. Furthermore, given that poor supervision was significantly related to concurrent obesity in older but not younger children, the findings suggest that parental awareness of their young school-aged child’s daily activities may be particularly important as the child becomes increasingly independent. Because previous studies have not isolated the unique contribution of supervisory neglect to obesity, a replication of this moderated supervision effect would be appropriate. Additionally prospective studies of supervision, and experimental interventions designed to alter parental supervision, should be conducted to determine whether a focus on supervision would be an effective strategy for influencing the BMI trajectory of school-aged children. Such experimental studies, conducted in the context of a therapeutic intervention, would make it possible to avoid the limitations of correlational designs.

Given the correlational nature of the data, it is impossible to identify a specific mechanism whereby neglectful parenting or poor supervision could confer risk for childhood obesity. A number of viable candidates can be identified. Obtaining mothers’ BMI scores was not part of the research protocol, but informal observations suggested an association, albeit not perfect, between maternal obesity and child obesity. While it is tempting to invoke notions of heritability, it is also the case that poor attention to healthy habits, exercise, and excessive ingestion would confer risk for obesity to both adults and children in a household. The link between child sexual abuse and later obesity has been hypothesized to be a consequence of stress experienced by the child, resulting in a dysregulation of the hypothalamic–pituitary–adrenal (HPA) axis and associated neuro-hormonal problems that result in metabolic dysfunction, as well as ingestive problems (c.f. Noll et al., 2007). Dysregulation of the HPA axis could also be a consequence of being reared in a neglectful home. The notion that neglectful parenting could result in an increased allostatic load (c.f. McEwen, 2003) that predisposes a child to react adversely to normal circumstances of stress is another mechanism whereby early neglect could confer risk for obesity. Although the neglect assessed in this study is not likely to be an acute traumatic stressor, living under the conditions of the more neglecting households is likely to be associated with chronic stress and increased allostatic load. Of course, both neglectful parenting and childhood obesity could reflect the operation of an unmeasured third variable. Although an attempt was made to control for the obvious third variable of social disadvantage, the approach used does not exhaust the range of

adverse environmental events that could confer risk to both neglect and childhood obesity.

The results of this study do have implications for the health care of disadvantaged children. Within this disadvantaged sample, the obesity rates are alarming and underscore the critical need to develop efforts to mitigate obesity in youth living in poverty. Although the base rate of obesity is high in this sample, the data are not unlike those from other studies with disadvantaged children (Ogden et al., 2002; Lacar et al., 2000). Of course, not all children in the sample were overweight or obese. Moreover, the index of social disadvantage based on household attributes, maternal education, and maternal occupation did not correlate with obesity. Thus, poverty per se is not the sole contributor to obesity and, within a disadvantaged sample, some degree of social advantage (i.e., educational attainment; occupational attainment) does not seem to reduce risk for childhood obesity. Because the amount of variance accounted for by the parenting indices was modest, the findings indicate that childhood obesity is a multi-determined problem that is not likely to yield to simple parenting solutions. The findings do underscore the need of practitioners to focus some efforts on circumstances of care neglect for preschool and kindergarten children, and consider efforts to enhance parental supervision of children in the early elementary school years. Importantly, the association between BMI percentile scores and indices of parenting also suggest that BMI can serve as a potential marker of care neglect in young children and poorer supervision in older children.

Acknowledgment

The statistical consultation by Jacob J. Oleson, and the facilitation of the research by Trisha Barto, Marc Baty, Barry Bennett, Wayne McCracken, Mindy Norwood, Jeff Regula, Mark Schmidt, and Cheryl Whitney (Iowa Department of Human Services), Paul Spencer (Oneida County Department of Social Services), and the assistance of Ashley Anderson, Robin Barry, Lisa Bauer, Allyson Bone, Beth Boyer, Kristy DePalma, Aubra Hoffman, Esther Hoffman, Kathryn Holman, Kyla Kinnick, Robert Latzman, Mary McCarren, Katie Meyer, Bethany Murphy, Lauren Ann Rapier, Eunyo Ro, and Nicole Shay is gratefully acknowledged.

Funding

This research was supported in part by grant RO1 MH 61731 funded by National Institute of Mental Health and Agency for Children, Youth, and Families

(to J. F. K., PI); and in part by grant R01 HD-46789 funded by Eunice Kennedy Shriver National Institute of Child Health and Human Development (to J. F. K., PI).

Conflicts of interest: None declared.

Received March 5, 2009; revisions received October 23, 2009; accepted October 29, 2009

References

- Adams, R. E., & Bukowski, W. M. (2008). Peer victimization as a predictor of depression and body mass index in obese and non-obese adolescents. *Journal of Child Psychology and Psychiatry*, 49(8), 858–866.
- Barlow, S. E., & the Expert Committee. (2007). Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: Summary report. *Pediatrics*, 120, S164–S194.
- Caldwell, B. M., & Bradley, R. H. (1978). *Home observation and measurement of the environment*. Little Rock: University of Arkansas Press.
- Cohen, J., & Cohen, P. (1983). *Applied multiple regression/correlation analysis for the behavioral sciences*, 2nd edition. NJ: Erlbaum: Hillsdale.
- Christoffel, K. K., & Forsyth, B. W. (1989). Mirror image of environmental deprivation: Severe childhood obesity of psychosocial origin. *Child Abuse & Neglect*, 13, 249–256.
- Clement, P., & Richard, R. (1976). Identifying reinforcers for children: A children's reinforcement survey. In E. Mash, & R. Terdal (eds), *Behavior therapy assessment: Diagnosis, design and evaluation* (pp. 207–216). New York: Springer.
- Cornette, R. (2008). The emotional impact of overweight/obesity on children. *Worldviews on Evidence-Based Nursing*, 5(3), 136–141.
- DeGarmo, D. S., Reid, J. B., & Knutson, J. F. (2006). Direct laboratory observations and analog measures in research definitions of child maltreatment. In M. Feerick, J. F. Knutson, P. K. Trickett, & S. M. Flanzer (eds), *Defining and classifying child abuse and neglect for research purposes* (pp. 297–332). Brookes: Baltimore.
- Dishion, T. J., & McMahon, R. J. (1998). Parental monitoring and the prevention of child and adolescent problem behavior: A conceptual and empirical formulation. *Clinical Child and Family Psychology Review*, 1, 61–75.

- Dubowitz, H. (2006). Defining Child Neglect. In M. Ferrick, Knutson, J., Trickett, P., & S. Flanzer (eds), *Child abuse and neglect*. Baltimore: Brooks Publishing.
- Gilbert, R., Widom, C. S., Browne, K., Fergusson, D., Webb, E., & Janson, S. (2009). Burden and consequences of child maltreatment in high-income countries. *Lancet*, *373*, 68–81.
- Giovannoni, J. (1985). Overview of issues on child neglect, in *Child Neglect Monograph: Proceedings from a Symposium*, November 10, 1985. Washington, DC, Clearinghouse on Child Abuse and Neglect Information (Department of Health and Human Services), pp. 1–6.
- Hall, L. (1986). *Parent awareness of children's activities and preferences*. Unpublished doctoral dissertation. The University of Iowa.
- Hebebrand, J., & Herpertz-Dahlmann, B. (2009). Psychological and psychiatric aspects of pediatric obesity. *Child and Adolescent Psychiatric Clinics of North America*, *18*(1), 49–65.
- Hebebrand, J., & Hinney, A. (2009). Environmental and genetic risk factors in obesity. *Child and Adolescent Psychiatric Clinics of North America*, *18*(1), 83–94.
- Hegar, R. L., & Yungman, J. J. (1989). Toward a causal typology of child neglect. *Child and Youth Services Review*, *11*, 203–220.
- Holmbeck, G. N. (2002). Post-hoc probing of significant moderational and mediational effects in studies of pediatric populations. *Journal of Pediatric Psychology*, *27*(1), 87–96.
- Knutson, J. F., DeGarmo, S., Koeppl, G., & Reid, J. B. (2005). Care neglect, supervisory neglect, and harsh parenting in the development of children's aggression: A replication and extension. *Child Maltreatment*, *10*(2), 92–107.
- Knutson, J. F., DeGarmo, D. S., & Reid, J. B. (2004). Social disadvantage and neglectful parenting as precursors to the development of antisocial and aggressive child behavior: Testing a theoretical model. *Aggressive Behavior*, *30*, 187–205.
- Knutson, J. F., Lawrence, E., Taber, S. M., Bank, L., & DeGarmo, D. S. (2009). Assessing children's exposure to intimate partner violence. *Clinical Child and Family Psychology Review*, *12*, 157–173.
- Knutson, J. F., & Scharz, H. A. (1997). Physical abuse and neglect of children. In T. A. Widiger, A. J. Frances, H. A. Pincus, R. Ross, M. B. First, & W. Davis (eds), *DSM-IV sourcebook* (Vol. 3, pp. 713–804). Washington, DC: American Psychiatric Association Press.
- Lacar, E. S., Soto, X., & Riley, W. J. (2000). Adolescent obesity in a low-income Mexican American district in South Texas. *Archives of Pediatrics and Adolescent Medicine*, *154*, 837–840. Retrieved from www.archpediatrics.com.
- Laing, J. A., & Sines, J. O. (1982). The Home Environment Questionnaire: An instrument for assessing several behavioral relevant dimensions of children's environments. *Journal of Pediatric Psychology*, *7*, 425–449.
- Leventhal, T., Selner-O'Hagan, M. B., Brooks-Gunn, J., Bingenheimer, J. B., & Earls, F. J. (2004). The home-life interview from the project on human development in Chicago neighborhoods: Assessment of parenting and home environment for 3- to 15-year-olds. *Parenting: Science & Practice*, *4*, 211–241.
- Lissau, I., & Sorensen, T. I. (1994). Parental neglect during childhood and increased risk of obesity in young adulthood. *Lancet*, *343*, 324–327.
- Loevinger, J. (1956). Objective tests as instruments of psychological theory. *Psychological Reports*, *3*, 635–694. Retrieved from <http://ejournals.ammonsscscientific.com/>.
- McEwen, B. S. (2003). Mood disorders and allostatic load. *Biological Psychiatry*, *54*, 200–207.
- Murray, K. T., & Sines, J. O. (1996). Parsing the genetic and nongenic variance in children's depressive behavior. *Journal of Affective Disorders*, *38*, 23–34.
- Noll, J. G., Zeller, M. H., Trickett, P. K., & Putnam, F. W. (2007). Obesity risk for female victims of childhood sexual abuse: A prospective study. *Pediatrics*, *120*, e61–e67.
- Office of Human Development Services. (1981). *National Study of the Incidence and Severity of Child Abuse and Neglect*. Washington, DC: U.S. Department of Health and Human Services.
- Office of Human Development Services. (1988). *Study findings: Study of national incidence and prevalence of child abuse and neglect: 1988*. Washington, DC: U.S. Department of Health and Human Services.
- Ogden, C. L., Kuczmarski, R. J., Flegal, K. M., Mei, Z., Guo, S., Wei, R., et al. (2002). Centers for Disease Control and Prevention 2000 growth charts for the United States: improvements to the 1977 National Center for Health Statistics version. *Pediatrics*, *109*, 45–60. Retrieved from <http://www.pediatrics.org>.
- Peterson, L., Ewigman, B., & Kivlahan, C. (1993). Judgements regarding appropriate child supervision to prevent injury: The role of environmental risk and child age. *Child Development*, *64*, 934–950.
- Polansky, N. A., Hally, C., & Polansky, N. F. (1975). *Profile of neglect: A survey of the state of knowledge of*

- child neglect*. Washington, DC: Community Services Administration, Social and Rehabilitation Services, DHEW.
- Sedlak, A. J., & Broadhurst, D. D. (1996). *Third national incidence study of child abuse and neglect: Final report*. Washington, DC: U.S. Department of Health and Human Services, Administration for Children and Families, Administration on Children, Youth, and Families, National Center on Child Abuse and Neglect.
- Selner, M. E. (1992). The role of childhood sensation seeking and parental supervision in the emergence of childhood psychopathology. *Unpublished doctoral dissertation*. The University of Iowa.
- Selner, M. E., & Knutson, J. F. (1990). The development of the Children's Experience and Excitement Scale. *Paper presented at the Midwestern Psychological Association Meeting*. Chicago: May 3, 1990.
- Shay, N. L., & Knutson, J. F. (2008). Maternal depression and trait anger as risk factors for escalated physical discipline. *Child Maltreatment, 13*, 39–49.
- Sines, J. O., Clarke, W. M., & Lauer, R. M. (1984). Home Environment Questionnaire. *Journal of Abnormal Child Psychology, 12*, 519–529.
- Sternberg, K. J., Knutson, J. F., Lamb, M. E., Bradaran, L. P., Nolan, C., & Flanzer, S. (2004). The Child Maltreatment Log: A PC-based program for describing research samples. *Child Maltreatment, 9*, 30–48.
- Straus, M. A., Hamby, S. L., Finkelhor, D., Moore, D. W., & Runyan, D. (1998). Identification of Child maltreatment with parent-child conflict tactics scale. Development and Psychometric Data for a National Sample of American Parents. *Child Abuse & Neglect, 22*, 249–270.
- Swinburn, B. (2009). Obesity prevention in children and adolescents. *Child and Adolescent Psychiatric Clinics of North America, 18*, 209–223.
- Sullivan, P. M., & Knutson, J. F. (1998). The association between child maltreatment and disabilities in a hospital-based pediatric sample. *Child Abuse & Neglect, 22*, 271–288.
- Sullivan, P. M., & Knutson, J. F. (2000). Maltreatment and disabilities: A population-based epidemiological study. *Child Abuse & Neglect, 24*, 1257–1274.
- Trocme, N. (1996). Development and preliminary evaluation of the Ontario Child Neglect Index. *Child Maltreatment, 1*, 145–155.
- Tymchuk, A. J., Lang, C. M., Dolyniuk, C. A., Berney-Ficklin, K., & Spitz, R. (1999). The home inventory of dangers and safety precautions-2: Addressing critical needs for prescriptive assessment devices in child maltreatment and in healthcare. *Child Abuse & Neglect, 23*, 1–14.
- U.S. Department of Health and Human Services, Administration on Children Youth and Families. (2001). *Child Maltreatment 1999*. Washington DC: U.S. Government Printing Office.
- U.S. Department of Health and Human Services, Administration on Children Youth and Families. (2002). *Child Maltreatment 2000*. Washington DC: U.S. Government Printing Office.
- Valles, N. L., & Knutson, J. F. (2008). Contingent responses of mothers and peers to indirect and direct aggression in preschool and school-aged children. *Aggressive Behavior, 34*, 497–510.
- Whitaker, R. C., Phillips, S. M., Orzol, S. M., & Burdette, H.L. (2007). The association between maltreatment and obesity among preschool children. *Child Abuse & Neglect, 31*, 1187–1199.
- Williamson, D. F., Thompson, T. J., Anda, R. F., Dietz, W. H., & Felitti, V. (2002). Body weight and obesity in adults and self-reported abuse in childhood. *International Journal of Obesity, 26*, 1075–1082.