



Contents lists available at ScienceDirect

Infant Behavior and Development



Nonstandard maternal work schedules during infancy: Implications for children's early behavior problems

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ARTICLE INFO

Article history:

Received 12 March 2008

Received in revised form 10 October 2008

Accepted 29 December 2008

Keywords:

Maternal nonstandard work schedules

Early behavior problems

Infant temperament

Maternal depressive symptoms

ABSTRACT

This paper examines the associations between maternal nonstandard work schedules during infancy and children's early behavior problems, and the extent to which infant temperament may moderate these associations. Hypothesized associations were tested using data from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care (Phase I). Analyses focused on mothers who returned to work by the time the child was 6 months of age, and who worked an average of at least 35 h per week from 6 through 36 months. At 24 and 36 months, children whose mothers worked a nonstandard schedule had higher internalizing and externalizing behaviors. Modest, albeit inconsistent, evidence suggests that temperamentally reactive children may be more vulnerable to maternal work schedules. Maternal depressive symptoms partially mediated associations between nonstandard maternal work schedules and child behavior outcomes.

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As the 24/7 economy expands in the United States, work schedules, particularly those of mothers of young children, require special attention. Work scheduling involves consideration of both the hourly timeframe and the weekly schedule within which a job is performed (Presser, 1995). Combining these two dimensions yields several schedules that can be categorized as either "standard" (e.g., Monday–Friday, 8–5) or "nonstandard." Nonstandard schedules include fixed days, fixed non-day (e.g., working nights) and non-fixed schedules (e.g., rotating shifts). Nonstandard work schedules, or those that exist outside the typical 8–5, Monday–Friday day schedule (Presser, 1995) are common among women with young children, and the numbers of women in these work arrangements are projected to continue to increase (Presser, 2003). In 2004, 13.2% of working mothers in the United States with children under the age of 6 were employed in a job requiring a nonstandard work schedule, and 8.5% of women in the United States with young children worked either evenings or nights (U.S. Department of Labor, 2005). Additionally, U.S. labor projections suggest that more mothers of young children are likely to work in jobs requiring nonstandard schedules in the future. Occupations with high concentrations of nonstandard schedules mirror those with the largest projected absolute growth such as food preparation and service (#1) and customer service representatives (#2) (Belman & Golden, 2000; Hecker, 2001), and they represent the type of jobs that are heavily occupied by mothers of young children (Presser & Hermsen, 1996).

Previous research on nonstandard work schedules has focused primarily on the worker. For example, research indicates that working a rotating shift contributes to exhaustion by interfering with circadian rhythms and sleep cycles (Pilcher,

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Lambert, & Huffcutt, 2000), and that physical exhaustion is implicated in the association of shift-work with poor family functioning (Fenwick & Tausig, 2001; Jackson, McDaniel, & Rao, 1985; Khaleque, 1999; Staines & Pleck, 1984). Sleep disruption and physical exhaustion may also place individuals at increased risk for emotional difficulties including depression (Costa, 1996). In addition, individuals working fixed weekend shifts miss social activities with family and friends that are frequently planned during weekends (Zerubaval, 1985) which may create additional burdens and strain on the marital relationship and family functioning (Staines & Pleck, 1984). Overall, this research suggests that nonstandard work schedules result in sleep disruption and fatigue, increased risk for depression, and greater marital strain and relationship difficulties in families (Fenwick & Tausig, 2001; Jackson et al., 1985; Khaleque, 1999; Pilcher et al., 2000; Staines & Pleck, 1984; Zerubaval, 1985). It is possible that the individual effects of nonstandard work schedules for individuals may in turn impact child behavior outcomes for the children of nonstandard workers. Given the importance of the mother–child relationship during infancy and the fact that nonstandard work arrangements are common among women with infants, this paper focuses on the putative effects of maternal nonstandard work schedules on children's early behavior problems, and it considers possible maternal and child factors involved in this relationship.

1. Theoretical framework

The bioecological model of human development (Bronfenbrenner & Ceci, 1994) provides a useful framework for understanding the relationships between maternal nonstandard work schedules and the subsequent impact on child behavior outcomes. Bioecological theory suggests that proximal processes, or person–environment interactions that become progressively more complex over time (Bronfenbrenner & Ceci, 1994), drive human development. The theory further contends that the shape and power of proximal processes are influenced by physical and social aspects of individuals' environments. We conceptualize nonstandard work arrangements as an environmental circumstance that has potential for individual effects on maternal well-being and behavior and which in turn influences early child development. More specifically, the stress and strain of a nonstandard work schedule may leave mothers physically and emotionally exhausted and less able to interact with their infant in a developmentally generative way, thereby creating an opportunity for poorer child development outcomes such as behavioral problems.

Child behavior represents an important area of inquiry in the context of mothers' nonstandard work schedules, as the variable or potentially inconsistent availability of a mother to her infant could negatively impact the infants' early behavioral development. Crockenberg and Leerkes (2000) described the first 3 years of life as a critical period and rapid stage of growth for behavioral development, noting that development during this period may significantly impact the likelihood of later behavioral and emotional dysfunction. During the first 3 years of life infants begin to understand their own thoughts and feelings, they become able to share their thoughts and feelings with others, and they begin to understand others' thoughts and feelings (Campos & Stenberg, 1981; Stern, 1985). Moreover, infants learn about the appropriate expression and control of emotions and behaviors, skills whose absence are closely linked to the development of behavior problems over time (Calkins & Degnan, 2006; Thompson & Lagattuta, 2006). Mother–infant interactions play an integral role in this process, with the infant's learning based substantially on the mother's affect, responses, proximity, and her availability to the infant (Crockenberg & Leerkes, 2000).

Nonstandard work schedules of mothers with young children can interfere with their infants' ability to make sense of their surroundings and routines, especially in relation to dominant caregivers (Cassidy & Berlin, 1994). Chronic night and evening work leaves mothers, many of whom "tag-team" parent to live up to the ideology of intensive mothering, physically and emotionally exhausted because they are "on the go" nearly 24 h a day (Hattery, 2001a, 2001b). Similarly, variable schedule jobs (i.e., those that change from day to day or week to week) pose significant barriers for mothers to be available to their infants. In addition, nonstandard maternal work schedules could interfere with a family's ability to create and maintain family routines (e.g., specific meal times and bedtime routines). Consistency in daily family life, particularly family routines and rituals, has been linked to lower externalizing symptoms and higher prosocial, cooperative, and compliant behavior among preschoolers (Keltner, 1990; Koblinsky, Kovalanka, & Randolph, 2006) and are believed to promote better self-regulation in infancy (Fiese et al., 2002). Thus, nonstandard maternal work schedules, whether fixed non-day shifts or variable shifts, have the potential to undermine optimal child behavior outcomes and require empirical investigation.

Although a variety of studies have noted the potential negative effects of work schedules, economic stress, and inflexibility in work schedules on mothers' well-being and availability to her family (Bryant, Zvonkovic, & Reynolds, 2006; Roy, Tubbs, & Burton, 2004), only a small number of studies to date have specifically examined the potential effects of nonstandard maternal work on behavior development among young children. Three studies are especially relevant. First, Strazdins, Korda, Lim, Broom, and D'Souza (2004), drawing on cross-sectional survey data, reported that the odds of having a young child with a behavioral problem were 39% greater among mothers who worked a nonstandard versus standard schedule. This effect was reported to be particularly strong among children aged 2–4 years and among the socio-economically disadvantaged. In a follow-up study based on data from a large Canadian cohort, Strazdins, Clements, Korda, Broom, and D'Souza (2006) reported that children with one or more parents in nonstandard work schedules experienced greater social and emotional difficulties. Most recently, Joshi and Bogen (2007) reported that mothers' nonstandard work schedules were associated with negative behavioral outcomes as measured by the Child Behavior Checklist (Achenbach, 1991) for children between the ages of 2 and 4. Taken together, these studies provide compelling cross-sectional evidence suggesting that child behavior development among preschoolers may be affected by parental nonstandard work schedules. Additional research is needed

to determine if cross-sectional associations among nonstandard work schedules and child behavior development can be replicated longitudinally.

The bioecological model further suggests that dispositional characteristics of the focal child can modify the effects of person–environment interactions relevant to child development (Bronfenbrenner & Morris, 1998), suggesting that some children may be more vulnerable to nonstandard maternal work schedules. One such characteristic is infant temperament which refers to biologically based differences in emotional, attentional, motor, and regulatory processes that are stable over time and across contexts (Rothbart & Bates, 1998). Infants classified as temperamentally reactive (previously described as “difficult”) are easily and intensely distressed, difficult to soothe, and have difficulty adapting to change (Rothbart & Bates, 1998; Thomas & Chess, 1977). A number of researchers suggest that temperamentally reactive infants are predisposed to the development of behavior problems by virtue of their extreme emotional characteristics, and much research supports this proposition (see Calkins & Degnan, 2006, for a review). However, our primary interest in temperament is in the possibility that maternal nonstandard work schedules affect children differently depending on their temperamental dispositions; a person \times environment interaction. According to the classic notion of “goodness of fit” (Lerner & Lerner, 1987; Thomas & Chess, 1977), children whose characteristics are incongruent with the demands of their environment are less likely to demonstrate adaptive developmental outcomes. According to this view, features of mothers’ nonstandard work schedules that contribute to disruptions in or the inability to establish daily routines (Fagan, 2001; Hattery, 2001a, 2001b; Kalleberg & Epstein, 2001) should be most problematic for infants who react negatively to change and struggle to regulate their arousal.

It may also be the case that the joint effect of temperament and maternal work schedules on early behavioral problems is mediated by maternal depression and maternal sensitivity. Infant temperamental reactivity and maternal nonstandard schedules are both believed to undermine maternal well-being and parenting. For example, infant temperamental reactivity or negative emotionality is associated with elevated maternal depressive symptoms and less sensitive maternal behavior, presumably because infant crying is experienced as aversive and placing additional demands on mothers’ time (Cutrona & Troutman, 1986; Murray, Stanley, Hooper, & King, 1996; Papousek & von Hofacker, 1998; Teti & Gelfand, 1991). Likewise, maternal nonstandard work arrangements, particularly fixed non-day shifts, may leave the mother emotionally and physically exhausted thereby undermining her ability to be responsive to her infant (Han, 2005; Hattery, 2001a, 2001b; Strazdins et al., 2006). The combination of a difficult infant and a job whose temporal features present challenges for mothers presents multiple stressors that may particularly challenge or undermine maternal well-being and sensitivity. Consistent with this view, previous data indicate that difficult infant temperament is more strongly positively associated with maternal depression and more strongly negatively associated with maternal sensitivity when other risk factors are present (Clark, Hyde, Essex, & Klein, 1997; Crockenberg & Leerkes, 2003; Paulussen-Hoogbeem, Stams, Hermanns, & Peetsma, 2007).

The elevated maternal depression and insensitive maternal behavior which result from nonstandard maternal work schedules and the social and psychological sequelae of this work arrangement may, in turn, contribute to behavioral and emotional difficulties for the child. That is, mothers who are physically and emotionally challenged may be ill-equipped to meet their infants’ emotional needs. In turn, this may increase their infants’ negative emotional states and make it more difficult for them to learn the skills to regulate these emotions effectively and ultimately, contribute to behavioral problems over time. Data indicating that young children were more likely to demonstrate elevated internalizing and externalizing symptoms and less effective self-regulation when their mothers were depressed and/or parented them insensitively support this view (Bayer, Sanson, & Hemphill, 2006; Hoffman, Crnic, & Baker, 2006; Silk, Shaw, Forbes, Lane, & Kovacs, 2006; Smith, Calkins, Keane, Anastopoulos, & Shelton, 2004; Spinrad et al., 2007). Moreover, recent research demonstrates that the negative effect of nonstandard schedules on child adjustment was mediated by parent well-being and family relationships (Strazdins et al., 2004) and by parenting stress (Joshi & Bogen, 2007) lending support to this mediation hypothesis.

2. Present study

The present study expands existing literature by examining the interrelationships of mothers’ nonstandard work schedules and child characteristics on specific aspects of early child behavior problems over time. In addition, this paper explores whether or not infant temperament moderates the nature of the relationship between maternal nonstandard work schedules and early child behavior problems. We specifically focus our attention on early behavior problems among infants and toddlers given the applied clinical significance and practical relevance and importance of these outcomes. In addition, our focus in this study is on infants and toddlers whose mothers are employed full-time, as previous research has indicated that the number of hours rather than employment *per se* is linked to child development outcomes (Brooks-Gunn, Han, & Waldfogel, 2002; Hill, Waldfogel, Brooks-Gunn, & Han, 2005; Waldfogel, Han, & Brooks-Gunn, 2002).

One might expect that features of child care, particularly child care quality, may also mediate the association between maternal nonstandard employment and early behavior problems among infants and toddlers. In some samples, families in which mothers work in jobs with nonstandard schedules utilize father care and other types of relative care more than families in which mothers are employed in jobs with standard schedules (Han, 2004; Presser, 1986, 1988), and these types of care arrangements have been rated as lower quality than center-based and home-based childcare (Clarke-Stewart, Gruber, & Fitzgerald, 1994; Galinsky, Howes, Kontos, & Shinn, 1994). However, previous research in this sample demonstrated that fathers and relatives who provided care were rated higher on quality than were caregivers in child care homes or child care centers (National Institute of Child Health and Human Development Early Child Care Research Network, 1996). And of most import, children whose mothers were employed in jobs with nonstandard hours, especially during the first year, had better

quality care than children of mothers who never had jobs with nonstandard schedules (Han, 2005). Thus, child care quality is not a viable mediator of the proposed negative association between mothers' nonstandard work and subsequent behavioral functioning in this particular sample.

As such, our fundamental research question is whether or not infants and toddlers of mothers employed full time and working nonstandard schedules experience increased behavior problems as indicated by a standardized measure of behavior problems. Based on our application of bioecological theory and results of previous research, we hypothesize that a mother's nonstandard work schedule will predict greater child behavior problems as indicated by internalizing and externalizing symptoms, especially if maternal nonstandard work begins within the first year of an infant's life. Second, we hypothesize that the negative effect of nonstandard schedules on early child behavior problems will be stronger for children who are high on temperamental reactivity relative to those who are low on temperamental reactivity. Third, given literature indicating that nonstandard work arrangements may leave mothers emotionally and physically exhausted and less able to be responsive to her infant (Han, 2005; Hattery, 2001a, 2001b; Strazdins et al., 2006), we hypothesize that maternal depression and sensitivity mediate the main and moderated associations between nonstandard work arrangements and child behavior problems.

3. Method

3.1. Data and sample

The data for this study are from the National Institute of Child Health and Human Development (NICHD) Study of Early Child Care (SECC). The SECC began in 1991 and was designed to study the effects of various forms of non-maternal child care on a child's development over time. Participants for the study included 1364 children (born between January and November 1991) and their mothers from 10 data collection sites across the country. Primary data were collected when children were 1, 6, 15, 24, and 36 months, with phone interviews occurring every 3 months to assess maternal employment and use of child care (for detailed summary of study design and procedures, see NICHD Early Child Care Research Network, 2001).

The SECC sample was not designed to be nationally representative, but does include some variability in regards to race, ethnicity, and economic background. At enrollment, 75% of the sample children were non-Hispanic white ($n = 1042$), 12.8% were non-Hispanic Black ($n = 173$), and 6.6% were Hispanic ($n = 83$) with the remainder being Asian, Native American, and individuals of multiple races. Nearly 30% of mothers in the sample had a high school degree or less, one-third reported some college, and 35% of the sample reported having a Bachelor's or graduate degree. Nearly 20% of families received public assistance at enrollment in the study. Because of selection procedures, some disadvantaged groups were excluded from the sample (mothers under 18, not fluent in English, with a substance abuse problem, or living in dangerous neighborhoods). Between enrollment and the close of the first project phase when children were 36 months, 131 families (9.6%) were lost to follow-up, with slightly greater attrition among children in racial and ethnic minority families.

Our analytic sample is limited to mother–infant dyads for which the mother returned to work by the time the child was 6 months of age, and who worked an average of at least 35 h per week from 6 through 36 months. Our focus on children whose mothers are employed full-time follows from previous research indicating that the number of hours rather than employment *per se* is linked to child development outcomes (Brooks-Gunn et al., 2002; Hill et al., 2005; Waldfogel et al., 2002). By focusing on children of women working full-time, our analysis essentially asks whether nonstandard maternal work schedules pose added risk to children who are already at risk of poorer developmental outcomes because of circumstances surrounding their mothers' intensive employment. Estimates indicate that nearly three-fourths of women who return to work after their child is born do so within 6 months (Berger & Waldfogel, 2004). Approximately 60% of SECC participants reported working at the 6-month interview, 55% of whom were working 35 or more hours per week.

Our sample was comprised of 395 mothers who were, on average, 29.4 (S.D. = 5.1) years old at the time of the child's birth, and like the broader cohort, predominantly non-Hispanic white (see Table 1). Approximately one in seven mothers in our sample were members of a racial or ethnic minority group (16.7%). In general, this analytic sample was relatively advantaged in terms of education and earnings: most women reported either completing high school and some college (57.2%) or having a college degree or greater (40.0%), and only a small proportion of women (4.6%) reported cumulative poverty. On average, mothers reported taking approximately 9.5 (S.D. = 5.3) weeks of leave following the birth of their child with 53.3% of the sample reporting that they also had older children. The focal child was male for approximately half of the sample (50.5%). Women worked, on average, 41.2 h per week (S.D. = 5.7), and women reported having moderate levels of perceived flexibility on their jobs at 24 and 36 months.

3.2. Variables

3.2.1. Nonstandard work schedule

Maternal nonstandard work schedule is the primary independent variable in this study. Maternal work schedule information was obtained at eight points in time: at 1, 3, 6, 9, 12, 15, 24, and 36 months after the child's birth. We used as much of this information as possible to classify mothers' work schedules. Our coding scheme followed four general steps originally outlined by Han (2005). Although our coding scheme follows Han's logistics, our estimates are not the same due to different assumptions underlying our operational definitions of nonstandard work. Specifically, whereas Han classified any individual as employed in a nonstandard schedule if any reference to a nonstandard schedule was given (e.g., reporting working days

Table 1

Nonstandard work schedule variables, mother and child covariates, and early child behavioral outcomes: descriptive statistics (full-time workers only, $n = 395$).

Variables	<i>M</i>	<i>S.D.</i>	% of total	<i>n</i>
Nonstandard work schedule				
Began nonstandard work in 1st year			24.8	98
Began nonstandard work after 1st yr			8.4	33
During 2nd year			5.1	20
During 3rd year			3.3	13
Worked only standard schedule			66.8	264
Behavioral problems				
CBCL internalizing T score				
24 months	49.64	8.30		
36 months	51.02	8.83		
CBCL externalizing T score				
24 months	52.09	8.13		
36 months	51.11	8.17		
Temperamental reactivity				
Infant temperament (at 6 months)	3.13	0.37		
Potential mediators				
Maternal depression				
15 months	8.34	7.67		
24 months	9.21	8.19		
36 months	8.50	7.96		
Maternal sensitivity				
15 months	9.55	1.52		
24 months	9.52	1.71		
36 months	17.21	2.65		
Covariates				
Maternal age	29.35	5.11		
Maternal ethnicity (minority = 1)			16.9	67
Maternal education				
Less than high school			2.8	11
High school or some college			57.2	226
College graduate			40.0	158
Cumulative poverty				
Marital status (at 24 and 36 months)			4.6	18
Hours worked per week	41.69	5.72	86.3	341
Weeks of maternity leave	9.51	5.33		
Perceived job flexibility				
24 months	2.66	0.77		
36 months	2.67	0.72		

and nights), we did not make this assumption. Our decision was based on the idea that there is an important substantive difference between an individual who works days, but performs extra work at night, from someone whose job requires working nights. This decision is consistent with procedures used by the NICHD network in their approach to categorizing work schedule information (NICHD SECC, 1991, pp. 1–6). Therefore, our estimates are more conservative than Han's in regard to mothers working nonstandard work schedules.

In the first step for classifying schedules, mother's work schedule at each assessment was determined based on their response to a single question about the hours usually worked. A mother was considered to have a nonstandard schedule and coded as 1 if she was currently working and self-reported usually working either "evening," "night," or a "variable" schedule; 0 or "standard schedule" otherwise. The second step involved aggregating work schedule information across the 3-year study period. If a mother worked a nonstandard schedule at any point up to and including the 12-month assessment, she was considered to have worked a nonstandard schedule during the first year. The same logic was applied to the 15- and 24-month assessments (year 2) and to the 36-month assessment (year 3). In the third step, categories similar to those used by Han (2005) were created; specifically, mothers who (1) began a nonstandard schedule in the first year of their child's life, (2) began a nonstandard schedule *after* the first year, or (3) worked across the child's first 3 years, but never worked a nonstandard schedule.

Based on this operational definition, over two-thirds (66.8%) of full-time employed women worked a standard schedule job across their infants' first 3 years (Table 1). Another 25% of mothers began working a nonstandard schedule job at some point during their infant's first year of life, whereas fewer than 1 in 10 mothers (7.8%) began working a nonstandard schedule job after their infants' first year.

3.2.2. Temperamental reactivity

Infant temperament was assessed at 6 months using an adaptation of the [Carey and McDevitt \(1978\)](#) Infant Temperament Questionnaire. Mothers responded to a set of statements about their baby's mood, sleep habits, and behavior on a scale of 1 ("almost never" behaves this way) to 6 ("almost always" behaves this way). Items were summed with higher values indicating greater temperamental reactivity ($\alpha = 0.81$).

3.2.3. Potential mediators

Maternal depression was assessed at 15, 24, and 36 months using the 20-item Center for Epidemiological Studies Depression Scale (CES-D). Scores on the scale range from 0 to 60, with a score of 16 or higher considered to be clinically significant. Internal consistency for the CES-D across the assessment point was good ($>.80$ at each assessment). The intercorrelation of CES-D scores across time ranged from $r = .46$ (between depression at 15 and 36 months) to $r = .52$ (between depression at 24 and 36 months). Depression scores at each time point were considered separately because of their moderate intercorrelation.

Maternal sensitivity was also assessed at 15, 24, and 36 months. At each time point, mothers were videotaped in either the home (15-month assessment) or the lab (24- and 36-month assessments) during a free play interaction with their children, and these tapes were subsequently coded by trained observers. Coders rated the mothers' behavior during the interaction on a 4-point scale ranging from a 1, indicating that the behavior was not at all characteristic of the mother, to a 4, indicating that the behavior was highly characteristic of the mother. At 15 and 24 months, maternal sensitivity is measured as the sum of the ratings for mothers' responsiveness to non-distress, positive regard for the child, and intrusiveness (reversed) during the interaction. Scores range from 3 to 12, with higher numbers reflecting greater sensitivity. Estimated alpha for this measure is $.70$ at 15 months and $.74$ at 24 months. At 36 months, mother–infant interactions were coded on slightly different dimensions, using a 7-point scale. Thus, maternal sensitivity at 36 months is the sum of ratings for mothers' supportive presence, respect for the child's autonomy, and hostility (reflected) during the interaction. Scores for maternal sensitivity at 36 months can range from 7 to 29 ($\alpha = 0.78$). The intercorrelation of maternal sensitivity ranged from $r = .32$ (between sensitivity at 15 and 36 months) to $r = .46$ (between sensitivity at 15 and 24 months). Sensitivity scores at each time point were considered separately because of their moderate intercorrelation.

3.2.4. Behavioral problems

Behavioral problems were operationalized at 24 and 36 months using standard scores from the Child Behavior Checklist-2/3 (CBCL; [Achenbach, Edelbrock, & Howell, 1987](#)). *Internalizing problems* were operationalized using the Anxious/Depressed and Withdrawn Scales of the CBCL, whereas *externalizing problems* were operationalized using the Aggressive Behavior and Destructive Behavior subscales of the CBCL. The psychometric properties of this instrument are well established and internal reliability (measured using Cronbach's alpha) for the scales in this particular sample range from $.82$ (internalizing symptoms at 24 months) to $.89$ (externalizing symptoms at 36 months).

3.2.5. Covariates

All analyses included several controls including mother's age at the time of the child's birth, maternal ethnicity (minority = 1), number of weeks of leave the mother took from her primary job before returning to work, the child's gender, the child's birth order, and the geographic site from which the mother was recruited. Also included was the mother's education level, coded into mutually exclusive categories reflecting a high school degree or less, some college or technical training, and a college degree or more. Mother's rating of the flexibility of her job at 24 and 36 months, ranging from "not at all flexible" (1) to "completely flexible" (4) was also included in the models.

Poverty level was assessed at 1, 6, 15, 24, and 36 months, and was controlled for in regression models as a dichotomous variable based on income-to-needs ratio. The poverty variable was coded '1' if income-to-need is less than '1', and coded '0' if income-to-need is '1' or higher. In regression models predicting outcomes at 24 months, mothers were coded as being in having cumulative poverty been chronically poor (1) if they were poor 3 out of the 4 assessments up to and including 24 months. In models predicting outcomes at 36 months, mothers were coded as having been chronically poor if they were poor 3 out of the 5 assessments up to and including 36 months. Finally, mothers' marital status at 24 and 36 months was included as a covariate, and was coded as '1' if the mother was married or partnered at the time, '0' otherwise.

3.3. Analysis

Multivariate ordinary least squares regression models were fit to test the hypothesized effects of nonstandard maternal work schedules on child behavioral problems. Standard multiple imputation procedures ([Allison, 2002](#)) were used to accommodate missing data for independent variables. All models were fit sequentially. First, each outcome was regressed on dummy variables reflecting maternal employment in nonstandard work schedules, as well as personal (e.g., age, educational attainment, minority status, and poverty status) and occupational status (e.g., perceived flexibility) of the mother, and child characteristics (i.e., gender, birth order, and temperament). Results from these models were used to test hypotheses about the effect of nonstandard maternal work schedules on child behavioral problems. Then, interaction terms reflecting the multiplicative product of child temperament and nonstandard work schedules were entered into the model to determine if the effect of nonstandard work schedules on child outcomes was greater for children with more difficult temperaments.

Table 2

Results of hierarchical regression analysis predicting CBCL internalizing and externalizing scores at 24 months.

	Internalizing scores		Externalizing scores	
	B (S.E.)	B (S.E.)	B (S.E.)	B (S.E.)
Onset of nonstandard schedule (NS)				
Began NS in 1st year	0.17 (0.96)	0.13 (0.96)	2.49 (0.94)**	2.44 (0.94)**
Began NS in 2nd year	−1.12 (1.87)	−1.05 (1.87)	0.22 (1.83)	0.36 (1.82)
Child temperament at 6 months	4.36 (1.13)***	3.18 (1.32) [†]	4.61 (1.10)***	3.09 (1.28) [†]
Interaction terms				
Temperament × NS in 1st year		4.50 (2.74) [†]		5.20 (2.65) [†]
Temperament × NS in 2nd year		3.68 (4.72)		6.77 (4.59)
Constant	55.86 (3.55)***	55.54 (3.55)***	55.64 (3.47)***	55.17 (3.47)***

Models control for the effects of maternal age, education, race/ethnicity, marital status at 24 months, weeks of leave from primary job, perceived flexibility of job at 24 months, cumulative poverty status, child's gender, child's birth order, and recruitment site.

[†] $p < .10$.

* $p < .05$.

** $p < .01$.

*** $p < .001$ (two-tailed).

Child temperament was centered on the sample mean prior to creating interaction terms to reduce potential multicollinearity (Aiken & West, 1991). Interaction effects significant at a critical value of $p < .10$ are interpreted given the difficulty of identifying interaction effects in non-experimental research and the relatively small sample (Whisman & McClelland, 2005).

The regression models were fit with time-dependent indicators of nonstandard maternal work schedules. Specifically, all models included two dummy indicators of nonstandard work schedules (i.e., nonstandard before 12 months and nonstandard after the first year). Fitting models with two indicators of nonstandard work schedules allowed us to differentiate the potential effects of early exposure to nonstandard maternal work schedules (i.e., prior to the first year) from later or concurrent exposure (Han, 2006). However, “nonstandard employment after the first year” has a slightly different meaning for each outcome. For the 24-month outcome, the “nonstandard work after the first year” refers to nonstandard employment at 15 or 24 months. By contrast, at 36 months, “nonstandard employment after the first year” refers to any bout of nonstandard employment at 15, 24, or 36 months.

Standard techniques (Baron & Kenny, 1986) were used to test mediation. Specifically, proposed mediators were first regressed on indicators of nonstandard employment and relevant covariates. Proposed mediators that were found to differ by maternal work schedule were considered viable and advanced to the next stage of analysis. Viable mediators were then added to models for each child behavior problem outcome. Attenuation of a previously significant association between nonstandard employment and child behavior problem after adding viable mediators to the regression model was interpreted as indicative of mediation.

4. Results

The average internalizing score on the CBCL was 49.64 and 51.02 at 24 and 36 months, respectively. Externalizing scores were similar at 24 ($M = 52.1$; $S.D. = 8.1$) and 36 ($M = 51.1$; $S.D. = 8.2$) months. The average internalizing and externalizing scores are classified as subclinical indicating that the average child in the sample did not demonstrate clinically significant behavioral problems. However, 23 children (3.8%) reached the threshold of clinically significant internalizing behavior (i.e., T score ≥ 64) at 24 months, while 32 children (6.3%) met the threshold at 36 months. Twenty-nine children (6.1%) reached the threshold of clinically significant externalizing behavior at 24 months, while 20 (4.6%) met the threshold at 36 months. The mean and standard deviation for maternal assessment of child temperament at 6 months of age, a covariate in our statistical models, is also reported in Table 1.

Children's behavioral problems at 24 and 36 months of age differed by maternal work schedule (Tables 2 and 3). As depicted in Table 2, entrance into a nonstandard schedule job in the first year of the child's life is associated with higher externalizing scores at 24 months of age. Further, as hypothesized, the deleterious effect of nonstandard maternal work schedules is exacerbated by infant temperament such that the effect of nonstandard work schedules is greater among more reactive children. Specifically, among women whose job requires a standard work schedule, each unit increase in infant temperamental reactivity is associated with an increase of 3.1 in externalizing scores (i.e., the “main effect” for child temperament, $B = 3.09$, when everything else in the model equals 0); whereas a one unit increase in temperamental reactivity is associated with an increase of 8.3 in externalizing scores among women with a nonstandard schedule job (i.e., the “main effect” for child temperament combined with the interaction effect, $3.09 + 5.20$). Similarly, there is trend-level evidence suggesting that the association of temperamental reactivity with internalizing disorder is stronger among children whose mothers work in a nonstandard schedule job. At 36 months of age (Table 3), entrance into a nonstandard work schedule in the first year of the child's life is associated with both higher internalizing and externalizing behavior problems. It is important to note that these models control for the effects of CBCL scores at 24 months. Again, there is a trend-level interaction

Table 3
Results of hierarchical regression analysis predicting CBCL internalizing and externalizing scores at 36 months.

	Internalizing scores		Externalizing scores	
	B (S.E.)	B (S.E.)	B (S.E.)	B (S.E.)
Onset of nonstandard schedule (NS)				
Began NS in 1st year	2.12 (0.84)**	2.10 (0.85)**	1.73 (0.72)*	1.73 (0.72)†
Began NS after 1st year	1.56 (1.29)	1.49 (1.29)	1.25 (1.09)	1.25 (1.09)
Child temperament at 6 months	3.07 (1.01)**	1.92 (1.18)†	1.72 (0.85)*	1.34 (1.00)
Interaction terms				
Temperament × NS in 1st year		3.86 (2.37)†		2.39 (2.02)
Temperament × NS after 1st year		3.91 (3.39)		−1.19 (2.87)
CBCL score at 24 months	0.58 (0.04)***	0.58 (0.04)***	0.64 (0.04)***	0.64 (0.04)***
Constant	23.99 (4.06)***	23.74 (4.05)***	19.89 (3.51)***	20.02 (3.52)***

Models control for the effects of maternal age, education, race/ethnicity, marital status at 36 months, weeks of leave from primary job, perceived flexibility of job at 36 months, cumulative poverty status, child's gender, child's birth order, and recruitment site.

† $p < .10$.
* $p < .05$.
** $p < .01$.
*** $p < .001$ (two-tailed).

suggesting that the effect of maternal nonstandard work schedules on internalizing scores is exaggerated by higher levels of temperamental reactivity. Overall, the pattern of results indicates that maternal nonstandard work in the first year of the child's life is associated with increased behavioral problems at 24 (Table 2) and 36 months (Table 3).

Table 4 summarizes associations between nonstandard maternal work schedules and the mediators that may link work schedules to child behavior outcomes. Depressive symptoms and maternal sensitivity at 15, 24, and 36 months were all examined to determine if they differed by maternal work schedule. As can be seen in Table 4, maternal depression at 15 months and maternal sensitivity at 24 months are the most probable mediators. Additionally, trend-level evidence ($p < .10$) suggests that both maternal depression and sensitivity at 36 months may be additional mediators. Depression at 24 months and maternal sensitivity at 15 months did not differ by maternal work schedule. Based on these analyses, maternal depression and maternal sensitivity at 24 and 36 months were added to regression models to evaluate the extent to which these variables mediate the association between nonstandard work arrangements and child behavior outcomes.

There was modest evidence that maternal depression at specific times partially explained the associations between nonstandard maternal work schedules and child behavior outcomes (Table 5). Turning first to externalizing behaviors at 24 months, the parameter estimate for nonstandard maternal work schedule was attenuated from 2.44 in Table 2 to 1.92 in Table 5. Similarly, the significant interaction term between child temperament and nonstandard work in the first year of the focal child's life evidenced in Table 2 was attenuated in the model containing the possible mediators (Table 5). Parameter estimate attenuation coupled with a significant independent effect for depressive symptoms suggests that the deleterious association between maternal nonstandard schedule work and externalizing behavior problems is partially explained by elevated maternal depression at 15 months (Sobel test statistic = 2.12, $p < .05$). Likewise, the estimates for nonstandard work

Table 4
Results of models examining associations among maternal nonstandard work schedules and possible mediators when the focal child is 15, 24, and 36 months of age.

Onset of nonstandard schedule (NS)	15 months B (S.E.)	24 months B (S.E.)	36 months B (S.E.)
Maternal depressive symptoms			
Began NS in 1st year	2.10 (0.89)*	−0.47 (0.81)	1.35 (0.79)†
Began NS after 1st year ^a	n/a	1.40 (1.55)	−0.15 (1.19)
Constant	6.75 (4.46)	0.10 (4.00)	−3.40 (3.86)
Maternal sensitivity			
Began NS in 1st year	0.07 (0.17)	−0.48 (0.17)**	−0.54 (0.28)†
Began NS after 1st year ^a	n/a	−0.49 (0.33)	−0.90 (0.43)†
Constant	10.02 (0.85)***	5.46 (1.00)***	10.19 (1.68)

Models control for the effects of maternal age, education, race/ethnicity, marital status at 36 months, weeks of leave from primary job, cumulative poverty status, child's gender, child's temperament, child's birth order, and recruitment site. Models for 24-month outcomes control for previous assessment at 15 months, and models for 36-month outcomes control for assessments at 15 and 24 months.

^a After 1st year represents entrance into a NS job at either 15 or 24 for the 24-month analysis, and entrance into a NS job at 15, 24, or 36 months for the 36-month analysis.

† $p < .10$.
* $p < .05$.
** $p < .01$.
*** $p < .001$ (two-tailed).

Table 5

Results of models examining if the associations between nonstandard maternal work schedules and child CBCL scores are mediated by maternal depression and sensitivity.

	24 months		36 months	
	Internalizing B (S.E.)	Externalizing B (S.E.)	Internalizing B (S.E.)	Externalizing B (S.E.)
Onset of nonstandard schedule (NS)				
Began NS in 1st year	−0.33 (0.96)	1.92 (0.93) [*]	1.81 (0.85) [*]	1.54 (0.72) [*]
Began NS in 2nd year	−1.03 (1.83)	0.63 (1.78)	1.42 (1.29)	1.10 (1.09)
Child temperament at 6 months	2.98 (1.30) [†]	2.89 (1.26) [†]	1.60 (1.17)	1.13 (1.00)
Interaction terms				
Temperament × NS in 1st year	4.03 (2.70)	4.66 (2.61) [†]	3.72 (2.36)	2.48 (2.01)
Temperament × NS in 2nd year	3.50 (4.66)	6.28 (4.50)	4.43 (3.39)	−1.18 (2.87)
Mediators				
Depression at 15 months	0.19 (0.05) ^{***}	0.21 (0.05) ^{***}	0.04 (0.05)	0.04 (0.04)
Depression at 36 months	n/a	n/a	0.14 (0.05) ^{**}	0.10 (0.04) [*]
Sensitivity at 24 months	−0.16 (0.26)	−0.21 (0.25)	0.04 (0.15)	0.21 (0.21)
Sensitivity at 36 months	n/a	n/a	0.04 (0.15)	−0.16 (0.13)
CBCL score at 24 months	n/a	n/a	0.56 (0.05) ^{***}	0.60 (0.04) ^{***}
Constant	54.18 (4.10) ^{***}	55.64 (3.98) ^{***}	22.10 (4.90) ^{***}	20.75 (4.22) ^{***}

Models control for the effects of maternal age, education, race/ethnicity, marital status at 24 months, weeks of leave from primary job, perceived flexibility of job at 24 months, cumulative poverty status, child's gender, child's birth order, and recruitment site.

[†] $p < .10$.
^{*} $p < .05$.
^{**} $p < .01$.
^{***} $p < .001$ (two-tailed).

on both internalizing and externalizing at 36 months in Table 3 are attenuated in Table 5 (2.10 and 1.92 for internalizing; 1.73 and 1.54 for externalizing). In this case, maternal depression at 36 months was the only mediator significantly associated with the outcomes, suggesting that depression may be a mediating mechanism. However, Sobel tests to evaluate the indirect pathways from nonstandard work to internalizing and externalizing behaviors through maternal depression at 36 months were not significant. Collectively, there was only modest evidence that nonstandard maternal work arrangements may affect child behavior at 24 through maternal depressive symptoms at 15 months. There is no evidence that maternal sensitivity explains differences in child behavior outcomes by maternal work schedule.

5. Discussion

There has been growing interest in the effects of nonstandard work schedules on child development. This interest is partially driven by projections anticipating that these jobs are becoming more common (Belman & Golden, 2000; Hecker, 2001) and by evidence suggesting that mothers of young children occupy these jobs (Presser, 2003; Presser & Hermsen, 1996). In addition, interest in the effects of nonstandard work schedules on child development has been piqued by research indicating that nonstandard maternal work schedules predict poorer cognitive development over time (Han, 2005), and cross-sectional research suggesting that nonstandard schedules may contribute to greater behavioral problems in young children (Joshi & Bogen, 2007; Strazdins et al., 2004, 2006). In this study, we examined the longitudinal effect of nonstandard work arrangements during infancy on early child behavior problems and considered the effects of infant temperament on these associations.

The results of this study clearly suggest that exposure to nonstandard maternal work schedules during the first year of life predicts subsequent child behavior problems at 24 and 36 months of age. These longitudinal findings complement and extend previous cross-sectional research documenting differences in child behavior outcomes by parental nonstandard work schedules (Joshi & Bogen, 2007; Strazdins et al., 2004, 2006). The results of this study are also consistent with research indicating that early exposure to nonstandard maternal work schedules predicted poorer cognitive development over time (Han, 2005). The collective body of evidence suggests that the projected expansion of jobs requiring nonstandard work schedules (Belman & Golden, 2000; Hecker, 2001) may pose significant threat to children's cognitive and socioemotional development, particularly if those jobs are occupied by mothers of infants.

This study also offers insight into the mechanisms involved in linking nonstandard maternal work schedules to child behavioral outcomes. Specifically, our results suggest that women with nonstandard work schedules during their child's first year of life have elevated depressive symptoms at subsequent time points, and that these depressive symptoms were associated with higher levels of behavioral problems among children. It should be noted, however, that these elevations in depressive symptoms and behavioral problems reflect elevations relative to lower levels of symptoms or problems, and that these elevations in scores may not reflect highly elevated scores or scores that would be considered "clinically significant" in a clinical or treatment setting. Nonetheless, approximately 10% of the association between nonstandard maternal work

schedules and child behavior problems was explained by maternal depression. These results are consistent with previous research linking nonstandard work schedules to poorer individual well-being (Fenwick & Tausig, 2001; Presser, 2003) and linking depression to child behavior problems (Bayer et al., 2006; Silk et al., 2006). It is the first time, however, that the putative pathways have been brought together in a single study. Further, the results are consistent with the conceptual argument that nonstandard work schedules leave mothers emotionally strained and potentially unable to effectively engage with their infants (Hattery, 2001a, 2001b; Presser, 2003; Strazdins et al., 2006).

However, the absence of evidence implicating maternal sensitivity as a mediating mechanism was the reverse of what we anticipated. Specifically, it is curious that maternal sensitivity was not significantly associated with child behavior outcomes in our analyses. In the NICHD sample as a whole, however, maternal sensitivity mediated and moderated the effects of maternal depression on child outcomes at 36 months (NICHD, 1999). Our findings are also inconsistent with other previous research (Smith et al., 2004; Spinrad et al., 2007), and may suggest that the effect of maternal sensitivity on child behavior is modified by contextual circumstances—a possibility that is consistent with the bioecological model of human development (Bronfenbrenner & Ceci, 1994). The absence of even partial mediation by maternal sensitivity is also curious because our working conceptualization posits that maternal depression would likely contribute to poor child outcomes because depression interferes with adults' ability to effectively parent, including sensitive or responsive parenting. This behavioral mechanism was obviously not supported, and it raises questions about alternative explanatory mechanisms linking nonstandard work and maternal depression to child outcomes. It is possible that depression undermines other aspects of maternal behavior such as the frequency of direct contact, the types of activities mothers engage in with their infants, the establishment of routines (Lyons-Ruth, Wolfe, Lyubchik, & Steingard, 2002), or how mothers react to infants' aversive social cues like crying (Schuetze & Zeskind, 2001). It is also possible that there is a genetic basis linking maternal depression to child behavior problems. Future research will need to explore each of these possibilities to further elaborate the sequence of events that link maternal nonstandard work schedules to child behavior.

A final contribution of this study is the consistent pattern of associations suggestive that infant temperament may exacerbate the effect of nonstandard maternal work schedules on child behavior problems. As predicted, one robust interaction effect and several trend-level ($p < .10$) associations suggest that temperamentally reactive children may be more vulnerable to nonstandard maternal work schedules. Specifically, we found that the effect of early exposure to nonstandard work schedules on externalizing problems differs by temperament, with greater externalizing difficulties noted among temperamentally reactive children. A similar, albeit less robust, pattern of associations emerged for internalizing behavior problems. These findings are consistent with the goodness of fit notion (Lerner & Lerner, 1987; Thomas & Chess, 1977), and suggest that reactive infants may find their mothers' nonstandard work arrangements more stressful than low reactive infants.

5.1. Limitations

The findings of this study must be interpreted within the context of its limitations. The most significant limitation of this study is the potential for misclassification bias. The NICHD Study of Early Child Care was not designed to study nonstandard work arrangements, so questions about work schedules were not probed in great detail to determine if work arrangements were required by the job. For example, in this study, mothers who reported usually working during the day and at night, were classified as "standard schedule" because we do not know if working at night was required by the job, or if the job requires daytime work but the individual was compelled (either by the job or personal motivation) to work additional hours in the evening. The implications of this subtle distinction are not known. For example, some mothers may choose to work a nonstandard schedule voluntarily so that she can spend the day time hours with her children (Garey, 1999). In such cases, it is possible that nonstandard work schedules are beneficial to or have no impact on child development. In a recent study by Barnett and Gareis (2007), the authors reported that there were no differences in parenting behaviors among mothers working day or evening shifts with children ages 8–14. In contrast to mothers who voluntarily enter into a nonstandard work arrangement, mothers who are required to work nonstandard hours (i.e., involuntarily enter into this arrangement), nonstandard work schedules may be associated with more negative effects on child development. In this sample, however, we do not have information on whether or not mothers voluntarily chose nonstandard work arrangements. As such, it remains an empirical question as to the full range of effects, both positive and negative, on child development.

Another limitation of this study is the relatively small sample size. Earlier research suggests that the negative implications of nonstandard work schedules on children's behavioral problems may be particularly strong in disadvantaged families (Strazdins et al., 2006); however, we were unable to replicate this finding because the sample did not have a sufficient number of women from disadvantaged families working a nonstandard schedule to test comparisons. It should also be noted that our focus in this study was on CBCL scores as a continuous outcome and that statistically significant differences were noted in mean standard scores for internalizing and externalizing outcomes at 36 months and at 24 and 36 months, respectively. While score differences reached statistical significance, additional research is needed to explore the role of maternal nonstandard work arrangements as a risk factor for the development of clinically significant internalizing and externalizing behavior problems among young children. Finally, the data for this study are over 10 years old, and it is possible that there has been a shift in the attitudes and resources for mothers working nonstandard schedules. Additional research based on more recent cohorts is needed.

5.2. Implications

Clinically, these findings have implications for early intervention efforts among children of mothers in nonstandard work arrangements. The fact that mothers' nonstandard employment early in life places young children's early development at risk for behavioral problems suggests that these families may need special assistance or intervention even if the infant is not currently displaying developmental difficulties or problems. In addition, our results suggest that low and high temperamentally reactive infants may have different intervention needs in terms of decreasing behavioral problems during the first 3 years of life and facilitating more positive behavioral outcomes. Parents, early childhood educators, and interventionists should give special consideration to the differential needs of infants with low and high temperamental reactivity. Future studies are needed to determine the most appropriate window of time for providing intervention efforts in this regard and to explore the short- and long-term benefits of intervention efforts on child development.

The results of this study also have salient practical and policy-related implications. Our results and those of other studies suggest that the expanding 24/7 economy may exact a toll on workers' children, and that this impact may be particularly detrimental among mothers of young children working in nonstandard schedules. If the results of this study are replicated in more recent and generalizable cohorts, it would suggest that policy makers need to begin questioning the potential health-related implications of the apparently unfettered growth of nonstandard work schedules. At the level of the individual, men and women may be faced with making the difficult decision between unemployment and working a nonstandard work schedule, weighing the individual costs and benefits for their own family. Assuming that the growth of nonstandard schedule jobs will continue, the results of our study suggest that workplace and community supports are needed to minimize the level of exhaustion and strain that may accompany nonstandard work schedules.

5.3. Summary

Taken together, the results of this study suggest that nonstandard work schedules present problems for infants' early child behavioral development and that the nature of the negative effect may depend in part on the child's temperament and the type of outcome under consideration. Additionally, maternal depression plays a partial role in explaining the association between nonstandard maternal work schedules and child behavior problems. Future prospective studies are needed to disentangle the effects of nonstandard work schedules on various aspects of child development and health outcomes over time and to further understand the differential effects of nonstandard work arrangements on child behavior problems for children with various temperamental traits.

Acknowledgment

This research was supported by a grant from the National Institute for Child Health and Human Development (HD-050204).

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