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Caregivers' perceived changes in engaged time with preschool-aged children during COVID-19: Familial correlates and relations to children's learning behavior and emotional distress

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ABSTRACT

The COVID-19 pandemic and its resulting containment measures have forced many children and their caregivers around the world to spend unprecedented amounts of time at home. Based on a sample of 764 households with preschool-aged children in Wuhan, China, where the pandemic began, this study examined how primary caregivers perceived changes in the amount of time spent engaging with their children (i.e., engaged time) from the start of the pandemic and whether these changes were associated with children’s learning behavior and emotional distress. The results showed that primary caregivers generally perceived increases in the amount of engaged time spent on indoor activities with their children but decreases in the amount of engaged time spent playing with their children outdoors. A bigger family size and greater loss of family income during the pandemic were associated with bigger perceived increases in caregivers’ engaged time spent on indoor activities, whilst a higher level of parental education was associated with bigger perceived decreases in engaged time spent playing with children outdoors. The family’s poorer physical health and higher levels of stress during the pandemic were related to smaller perceived increases in caregivers’ engaged time spent on educational activities. Finally, although bigger perceived increases in caregivers’ indoor engaged time (e.g., time spent on educational activities) were associated with higher levels of positive learning behavior and fewer symptoms of anxiety and withdrawal in the children, bigger perceived decreases in outdoor play time were associated with fewer symptoms of anxiety and withdrawal. These findings offer valuable insights into caregivers’ allocation of engaged time with their preschool-aged children during the COVID-19 pandemic.

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Introduction

The COVID-19 pandemic and its resulting containment measures have forced many schools to close and many adults to work from home around the world. Unsurprisingly, the amount of time during which parents and caregivers are physically available to their children, often referred to as ‘accessible time’ in the literature (Milkie et al., 2015), has been found to be much higher during the pandemic than prior to it (Craig & Churchill, 2021). Yet little is known about how the pandemic has affected the amount of engaged time caregivers have spent with their children on specific types of activities (e.g., playing, telling stories). It is important to study caregivers’ engaged time spent with their children because it has important implications for children’s learning (Zhang et al., 2019) and emotional health (Fiorini & Keane, 2014; Milkie et al., 2015). Based on a sample of 764 households with preschool-aged children in Wuhan, China, where the COVID-19 pandemic started, this study investigated whether the pandemic led primary caregivers to change the amount of time spent engaging with their children. It also examined which family characteristics were associated with changes in caregivers’ engaged time and whether these changes had implications for preschool-aged children’s learning and emotional distress.

I chose to study households in Wuhan because they had unique suffering during the COVID-19 pandemic. First, people in Wuhan knew little about how contagious and dangerous this coronavirus is and they experienced a lack of protective and medical equipment at the start of the pandemic (Kupfersmidt & Cohen, 2020). Second, Wuhan was hit the hardest by the pandemic and had the largest number of confirmed COVID-19 cases and deaths among all cities in China (50,340 confirmed cases and 3,869 deaths as of 31 May 2020; Hubei Health Commission, 2020). Third, Wuhan imposed one of the toughest lockdowns in the world (Chong et al.,...
2020). On 23 January 2020, the central government of China instituted a complete city lockdown in Wuhan, suspended all public transport, and prohibited residents of Wuhan from leaving the city (Chong et al., 2020). Although at first people were allowed out, from mid-February, almost all residents were prohibited from leaving their residential communities and all non-essential businesses were shut down (Chong et al., 2020). Consequently, caregivers in Wuhan might have had a unique pattern in their allocation of engaged time with their children during the pandemic.

Understanding the Impact of COVID-19 on Children and Families via a Life Course Lens

To understand how the COVID-19 pandemic and its resulting containment measures have affected caregivers and children in Wuhan, I took a life course perspective (Elder, 1998; Elder et al., 2003). The life course approach takes a historical perspective on individual and family development and looks at how macro-level sociohistorical events affect individual lives and family life. Emerging from studies on the impact of the Great Depression on children, life course theory posits that ‘historical forces shape the social trajectories of family, education, and work, and they in turn influence behavior and particular lines of development’ (Elder, 1998, p. 2). Research on sociohistorical events, such as natural, health, and socioeconomic disasters, suggests that they had both immediate and prolonged influences on human development (Elder, 1998; see a review in Benner & Mistry, 2020). For example, it has been found that school-age children who experienced previous pandemics (e.g., SARS in 2003, H1N1 in 2009) had high levels of emotional health problems, such as depression, anxiety, and posttraumatic stress disorders (PTSD; Ko et al., 2006; Sprang & Silman, 2013).

Life course theory emphasizes the interdependence of individual lives and takes the perspective that sociohistorical events affect interactions between family members (Rengstorf & Allen, 1993; Elder et al., 2003). For example, the Great Recession, which started in December 2007 in the United States and was associated with high levels of unemployment, was found to cause an increase in the incidence rates of maternal spanking (Brooks-Gunn et al., 2013). Likewise, the 2014 outbreak of Ebola virus disease (EVD) was demonstrated to lead parents in Liberia to increase their harsh parenting and household conflict (Green et al., 2018).

Life course theory also emphasizes that family characteristics (e.g., social and economic resources, physical health) differentially affect individual lives and family life during times of sociohistorical events, which may contribute to social stratification and rising inequality (Elder, 1998). In the Great Recession, for example, direct cash payments to low- and middle-income families in Australia helped mitigate the negative impact of the recession on the vulnerable families (UNICEF-IRC, 2014). In the 2014 outbreak of EVD in Liberia, parents from households that experienced EVD-related sickness or death reported more household conflict and were more likely to use harsh parenting than their counterparts from households that had no such experience (Green et al., 2018).

Finally, according to life course theory, changes in proximal environments, such as family life, serve as the intervening mechanism through which a sociohistorical event affects individual lives (Elder, 1998; Elder et al., 2003). In a longitudinal study of children and parents who experienced the 2011 Missouri and Alabama tornadoes, Bountress et al. (2020) found that parental distress and parent-child conflict prospectively predicted children’s PTSD. In a retrospective study of children and parents with SARS and H1N1 pandemic-related containment experiences (e.g., quarantine, isolation), Sprang and Silman (2013) showed that most parents diagnosed with PTSD had children who were similarly diagnosed.

The COVID-19 pandemic is one of the deadliest pandemics in history (Feehan, 2021). As of 4 August 2021, it had caused over 200 million confirmed infections and over 4 million deaths (Johns Hopkins University, 2021). It has led to stringent containment measures, such as school closures, home quarantine, and work-from-home arrangements, in many countries (Zhang, 2021). From a life course perspective, the pandemic has affected many aspects of family life, including caregivers’ allocation of engaged time to their children. There is also good reason to believe that family circumstances, some of which may have already existed before the emergence of COVID-19 while others altered by COVID-19, would be associated with changes in caregivers’ allocation of engaged time to their children during the pandemic. Finally, theoretically, any changes in caregivers’ time allocation to their children that are caused by the pandemic should subsequently exert an influence on the children’s learning behavior and emotional health.

COVID-19 and Caregivers’ Engaged Time with Preschool-aged Children

Prior research on large-scale sociohistorical events, such as earthquakes and financial crises, has documented that caregivers’ engaged time, defined as the amount of time caregivers spend engaging in specific types of activities (e.g., reading) with their children (Milkie et al., 2015), dramatically shifted during the events (e.g., Cano, 2019). For example, Kaneko and Noguchi (2020) found that the Great East Japan Earthquake led to perceived increases in parents’ engaged time spent with their young children in the most seriously affected regions. However, caregivers in families with children of various ages may respond to the same sociohistorical event in different ways. For instance, Bauer and Sonchak’s (2017) study of the Great Recession showed that an increase in state-level unemployment rates led mothers to decrease and fathers to increase the amount of engaged time spent with children aged 0–4 years. In contrast, mothers’ and fathers’ engaged time spent with older children (i.e., 5–17 years of age) was invariant to macroeconomic fluctuations. The age-related differences in caregivers’ engaged time spent with their children might be related to the general declining pattern in the amount of time caregivers spend in childcare as their children age (Kendig & Bianchi, 2008). Although all children demand time, preschool-aged children are in greater need of caregivers’ care, help, teaching and supervision than older children (Milkie et al., 2004). It is thus possible that sociohistorical crises, such as the COVID-19 pandemic, have created additional challenges to the engaged time of caregivers whose children are too young to be left unsupervised.

I reviewed the literature and did not locate any research on the impact of previous pandemics (e.g., SARS, H1N1, MERS) on caregivers’ engaged time. Nevertheless, one may speculate that the COVID-19 pandemic has led caregivers to increase the amount of engaged time spent with their preschool-aged children because preschools have closed and unemployment, home quarantine, and work-from-home arrangements have given caregivers more time at home. During the pandemic, caregivers may have experienced a ‘time windfall’ as a result of home quarantine, flexible working schedules or fewer working hours under the work-from-home arrangement, or changes in their employment status. The literature has shown that parents who worked fewer hours spent more time engaging with their preschool-aged children (Roeters et al., 2010), and unemployed parents were found to devote more engaged time to their preschool-aged children than employed parents (Kendig & Bianchi, 2008).

However, the evidence is mixed regarding whether and how the COVID-19 pandemic has led caregivers to change the amount of engaged time devoted to their young children. In a study of households with children aged 0 to 11 years in Germany, both
mothers and fathers reported that they spent more time on child-care tasks during the pandemic than before it, with the largest increases observed in parents of children aged 3 to 5 (Kreyenfeld & Zinn, 2021). Similarly, mothers and fathers in the United Kingdom reported that they spent approximately twice as much time on childcare during the lockdown as they did before the pandemic, with the largest increases observed in parents of children aged 0 to 5 (Zhou et al., 2020). By contrast, in a study of households with children aged 0 to 12 in the United States, most parents reported that they engaged more often in reading, playing, and going on walks with their children during the pandemic than prior to it, but less often or the same amount in telling stories and singing songs (Lee et al., 2021). In a study of families with young children (age: $M \pm SD = 5.7 \pm 2.0$ years) in Canada, Carroll et al. (2020) found that most of the families reported increases in screen time (for 74% of the mothers, 61% of the fathers, and 87% of the children) and decreases in physical activity (for 59% of the mothers, 52% of the fathers, and 52% of the children).

These mixed results may have various antecedents, such as differences in geographic locations and sociocultural backgrounds and in the type of activities caregivers engage in with their young children. For example, in the city of Wuhan, the 11 weeks of strict lockdown during the pandemic, when nearly all residents were prohibited from leaving their communities (Chong et al., 2020), likely led caregivers to decrease the amount of engaged time spent playing with their young children outdoors (i.e., outdoor engaged time) but increase the amount of time spent engaging in indoor activities such as reading and telling stories (i.e., indoor engaged time). In contrast, in countries and cities where no lockdown was imposed, caregivers might have spent more time engaging their preschool-aged children in both indoor and outdoor activities. By recruiting households in Wuhan, this study provides an opportunity to understand the impact of the COVID-19 pandemic on caregivers’ engaged time with their preschool-aged children in the original epicenter with a unique sociocultural background.

The Role of Family Characteristics in Caregivers’ Engaged Time with Preschool-aged Children

Although the COVID-19 pandemic might have led to a general increasing or decreasing pattern in the amount of time spent undertaking a certain activity, there might have been substantial variations in the changes in caregivers’ engaged time with their preschool-aged children. In the literature, a number of family characteristics, such as single parenthood (Kendig & Bianchi, 2008), lower family socioeconomic status (e.g., lower levels of family income and parental education; England & Strivastava, 2013), and larger family size (Esping-Andersen, 2009), have been found to limit the amount of engaged time caregivers spend with their children. These family characteristics may reflect insufficient or diluted family resources (e.g., economic and educational resources), preventing caregivers from investing sufficient engaged time with their children. I speculate that the family characteristics described above, which may have already existed before the emergence of the COVID-19 pandemic, would continue to be associated with a reduction in the engaged time that caregivers reported spending with their preschool-aged children during the pandemic.

Moreover, I hypothesize that family members’ physical health problems, family income instability, and household chaos resulting from the pandemic may have been potential family barriers that constrained caregivers’ engaged time with their preschool-aged children. The pandemic has brought multiple health, financial, and psychosocial challenges to many aspects of family life. First, the large number of COVID-19 infections and the resulting overwhelmed health systems have made it challenging for people to maintain physical health (Chong et al., 2020). Second, as many countries have shut down their non-essential businesses to contain the pandemic, the elevated unemployment rate has forced many families into poverty or at least income instability (United Nations, 2020). Third, containment measures such as school closures and work-from-home arrangements have disrupted family routines, created challenges for caregivers to balance multiple duties (e.g., managing their jobs, chores, and childcare), and led to disorder and chaos among many families (Zhang, 2022). These family circumstances may have impeded caregivers’ engaged time spent with their preschool-aged children. For example, the demands on caregivers to care for sick family members (e.g., those infected with SARS-CoV-2) and organize their households may have resulted in little available time to engage with their preschool-aged children. Income instability may have impeded positive parenting practices and limited the amount of attention and engaged time that caregivers could give to their preschool-aged children (Monahan, 2020).

Changes in Caregivers’ Engaged Time in Relation to Preschool-aged Children’s Learning Behavior and Emotional Health

Changes in caregivers’ allocation of engaged time with their preschool-aged children that are a result of the COVID-19 pandemic may subsequently influence the children’s learning behavior and emotional health. Learning behavior, also known as approaches to learning, has been identified as a core component of preschool children’s school readiness that predicts their reading and math achievement in the later years of schooling (Li-Grining et al., 2010). It refers to a broad set of skills and behaviors that reflect children’s enthusiasm, curiosity, persistence, and engagement in learning settings (Hyson, 2008). Emotional health is an umbrella term covering a range of emotional states, from diagnosable emotional distress and disorders at one end of the spectrum to emotional well-being at the other. In this study, children’s emotional health is indexed by four symptoms of emotional distress (Saylor et al., 1999), namely anxiety and withdrawal (i.e., displaying anxious and solitary behavior), fear (i.e., being afraid of something or someone), acting out (i.e., exhibiting out-of-control aggressive behavior in order to relieve tension), and COVID-19-related trauma (i.e., displaying intense emotional responses to COVID-19).

Caregivers’ engaged time with their preschool-aged children is considered to be critically important because it facilitates children’s learning through practice, instruction, and scaffolding (Barger et al., 2019). Moreover, the time caregivers spend engaging with their children often reflects their love and care for their children, which may protect children from developing emotional problems (Del Bono et al., 2016). The benefits of indoor and outdoor engaged time with caregivers for preschool-aged children’s learning behavior and emotional health during normal situations have been documented (e.g., Fiorini & Keane, 2014; Fonmy & Musick, 2018; Milkie et al., 2015). For example, in a study of 1,127 children aged 0 to 12 years in the United States, Hsin and Felfe (2014) showed that the amount of time mothers spent engaging with their children in educational and structured activities positively predicted children’s later levels of cognitive ability (verbal and math scores) and positive behavior (persistence and social skills). Moreover, these effects were stronger for children younger than 6 years old than for children 6 years and older. In a study of 15,077 children interviewed at age 3 in the United Kingdom, Del Bono et al. (2016) demonstrated that the amount of engaged time mothers and children spent together on educational and recreational activities was positively associated with the children’s cognitive skills and emotional health measured at age 7.

The extent to which findings obtained from studies during normal situations can be generalized to a health crisis situation such as pandemics may be limited; therefore, studies addressing the impact of the COVID-19 pandemic on children’s learning behavior and emotional health are urgently needed.
as the COVID-19 pandemic is unknown. It has been reported that the pandemic and its associated lockdown measures have resulted in extensive caregiving and mental health burdens for parents and caregivers (Wu et al., 2020), which have been linked to negative relationships with their children (Russell et al., 2020). While more time indoors in confinement may mean intense caretaking, teaching, and potentially stressful activities, outdoor engagement in confinement may mean more relaxed time, at least in Euro-American countries such as the United States (Lee et al., 2021). However, other countries or regions, such as Wuhan, implemented home quarantine and/or isolation rules and discouraged or even prohibited outdoor activities during the pandemic (Chong et al., 2020). To achieve this policy objective, the mass media in China further conveyed to people a message about the risk of catching and spreading coronavirus outdoors. So outdoor engagement in confinement may also mean an elevated risk of contracting COVID-19. It is unclear whether or how changes in the amount of outdoor and indoor time caregivers spend engaging with their preschool-aged children in such a situation affects children’s learning behavior and emotional health, especially for children who are experiencing school closures and cannot benefit from usual relationships with peers and teachers (e.g., Liu et al., 2020).

The Present Study

Drawing on life course theory (Elder, 1998; Elder et al., 2003), this study aimed to address three research questions: (1) Did primary caregivers in Wuhan perceive increases or decreases in the amount of time they spent engaging with their preschool-aged children indoors and outdoors from the start of the pandemic? (2) Which family characteristics were related to caregivers’ perceived changes in their engaged time with their preschool-aged children? (3) Were caregivers’ perceived changes in the amount of engaged time associated with preschool-aged children’s learning behavior and emotional distress? To achieve this goal, I recruited a sample of preschool children aged 3 to 6 years and their primary caregivers (i.e., the person primarily responsible for the care and upbringing of the child) in Wuhan. Based on the literature reviewed above, we hypothesize that (1) primary caregivers from Wuhan would perceive increases in the amount of indoor time spent engaging with their preschool-aged children but decreases in the amount of outdoor engaged time from the start of the pandemic; (2) single parenthood, lower family socioeconomic status (parental education, parental occupation, and family income in 2019), larger family size, being in poorer physical health, having greater income loss and more household chaos during the pandemic would be associated with smaller increases in both indoor and outdoor engaged time perceived by caregivers; and (3) greater increases in indoor and outdoor engaged time would be associated with preschool-aged children’s higher levels of positive learning behavior and fewer symptoms of emotional distress reported by caregivers. Because child age and sex have been found to relate to caregivers’ engaged time (Kendig & Bianchi, 2008; Sun et al., 2019) and preschool-aged children’s learning behavior and emotional distress (Cai, 2015; Saylor et al., 1999), we included them as control variables in this study.

The present study contributes to the literature in important ways. First, it focuses on a crisis situation. Crisis situations such as a pandemic can include life-altering events such as being quarantined, being seriously ill or hospitalised, losing a family member, losing a job, or experiencing financial hardship (Brown et al., 2020). As such, they might lead to a big change in family life (Prime et al., 2020). The COVID-19 pandemic provides a valuable opportunity to assess whether a health crisis situation can change caregivers’ allocation of engaged time to their preschool-aged children and whether these changes are associated with children’s learning behavior and emotional distress. Findings of this study will bring interesting complements to the life course theory and potential challenges to the existing theories of caregiver engagement and time allocation. Second, I examined a large pool of familial correlates of caregivers’ time investments during the COVID-19 pandemic. It is crucial to identify families who are most likely to decrease the amount of engaged time spent with their preschool-aged children during a pandemic and provide them with specific intervention services aimed at preventing such a decrease. Third, this study was conducted in Wuhan, the epicenter of China’s coronavirus outbreak. Life course theory’s principle of time and place emphasizes that individual and family development are embedded in and shaped by the geographic places where a sociohistorical event is experienced (Elder et al., 2003). In other words, the geographic location where people are living can determine how much a sociohistorical event such as the COVID-19 pandemic affects individual lives and family life, including caregivers’ time allocation to engage their preschool-aged children in different activities. As discussed above, the experience in Wuhan was very unique, and investigating the extreme situations of preschool-aged children and their families in Wuhan is another unique contribution of this study.

Method

Participants and Procedure

The participants in this study were the primary caregivers of 764 preschool-aged children (403 boys and 361 girls; age: M ± SD = 59.07 ± 12.28 months) recruited from nine preschools in the city of Wuhan, China. Using a purposive sampling technique, namely the typical case sampling method, I initially contacted 22 preschools located in the three major districts of Wuhan, and nine agreed to participate. The typical case sampling method, in which the typical cases of preschool children and their caregivers in Wuhan were identified, permits an easier generalization about the sample than random sampling, which was almost impossible during the pandemic. To meet the requirement of the typical case sampling method that researchers must have prior knowledge of the sample, three professors of early childhood in three different universities in Wuhan, who knew local preschools and residents very well, were responsible for recruiting schools. When recruiting schools, we considered the major attributes of the preschool programs (i.e., public vs private, school size) and the city population (i.e., income, education). According to Wuhan Statistical Bureau (2020), the sample was generally representative of the population of Wuhan in terms of household income (see online Appendix 1).

In China, most preschools accommodate children aged 3 to 6, who are typically grouped into three levels by age (Zhang, 2011): junior class (3 to 4 years old), middle class (4 to 5 years old), and senior class (5 to 6 years old). In 2019, the preschool gross enrolment rate reached 83.4% in China (Ministry of Education of China, 2020a). In this study, 310 (40.6%), 197 (25.8%), and 257 (33.6%) children were from junior, middle, and senior preschool classes, respectively. All of them were in preschool before the pandemic. Most of the participating children were the only child in their families (63.4%), followed by the last born child (19.6%), the first born child (13.7%), and the middle child (2.4%). Most parents (97.1%) were married or cohabiting and 2.9% were separated, divorced, or single; 29.5% of the mothers and 32.3% of the fathers had a Bachelor’s degree or above; 53.6% of the families had an annual income of RMB100,000 (US$14,290) or above in 2019. The average family size was 4.87 (SD = 1.75).

Data were collected between mid-June and mid-July 2020, when Wuhan was gradually reopening after the 11-week strict
lockdown, but all preschools remained closed and children remained out of school. Because the Ministry of Education of China (2020b) strictly prohibited preschools from conducting online teaching during COVID-19 school closures, I assumed that preschools did not conduct online teaching at the time of the study. Nevertheless, some children might have engaged in online learning assigned by their caregivers. A total of 1,200 consent forms and questionnaires were mailed to the nine principals, who then temporarily opened their schools to allow caregivers to participate. In two preschools, children’s primary caregivers were asked to complete consent forms and questionnaires at the school within one hour. In the other seven preschools, primary caregivers were asked to pick up consent forms and questionnaires from the school, fill them out at home, and return the completed questionnaires to the school. Of the 790 questionnaires (65.8%) returned, 26 were invalid. The Human Research Ethics Committee of the authors’ university approved the data collection procedures.

Most of the participating caregivers were the children’s mothers (n = 517), followed by fathers (n = 198), grandparents (n = 20), and other relatives (n = 5); the remaining caregivers (n = 24) did not indicate their relationship to the child. Most of the caregivers had a full-time job at the time of the study (62.0%), followed by being housewives or househusbands (19.1%), having a part-time job (7.7%), being out of work and looking for work (3.1%) and being out of work but not looking for work (3.1%); the remaining caregivers did not provide information about their job status. I did not collect information about whether the caregivers worked at home or online at the time of the study.

Measures

Changes in Caregivers’ Engaged Time with Children

Primary caregivers rated the change in the amount of time they spent engaging with their children in six activities (Table 1) from the start of the pandemic (January 20, 2020) using the Time Spent by Mothers and Others Scale (Singleton & Schmeer, 2020). A 5-point Likert scale was used (1 = increased a lot, 2 = increased a little, 3 = stayed the same, 4 = decreased a little, 5 = decreased a lot). I reverse-coded the items, so that higher scores indicated greater increases in caregivers’ engaged time with children. Principal factor analysis revealed the presence of two factors with eigenvalues exceeding 1: Items 2–6 belonged to Factor 1 (factor loadings ≥ .63), and Item 1 belonged to Factor 2 (factor loading = .97). Factor 2 was named ‘changes in outdoor engaged time’. Although Items 3–6 could occur both indoors and outdoors, Wuhan’s complete city lockdown, in which nearly all people were prohibited from leaving their communities, is likely to have caused the activities described in these items to have been conducted mainly indoors. I thus named Factor 1 ‘changes in indoor engaged time’. For Factor 1, Cronbach’s α was .81, and average scores were calculated.

Children’s Learning Behavior

To measure children’s learning behavior, primary caregivers completed the 6-item Chinese version of the Parent-report Preschool Children’s Approaches to Learning Scale: Short Form (Cai, 2015) on a 4-point Likert scale (1 = almost never, 2 = sometimes, 3 = often, and 4 = very often). The scale measures children’s initiative and curiosity, persistence, attentiveness, reflection and explanation, expressiveness, and creativity. Specifically, the six items ask whether the child takes the initiative to approach new things, finish a specific task persistently, focus on his or her work in a noisy environment, recognize mistakes and explain the reasons, express his or her own ideas and opinions in various ways, and make his or her own toys. Cronbach’s α was .83 in Cai (2015) and .81 in this study. Composite scores were calculated. Higher scores indicated more positive learning behavior.

Children’s Emotional Distress

To measure children’s emotional distress, primary caregivers completed the 21-item Pediatric Emotional Distress Scale (Peds) (Saylor et al., 1999). The Peds measures four symptoms of emotional distress, namely anxiety and withdrawal (e.g., “seems sad and withdrawn”; α = .74), fear (e.g., “seems fearful without good reason”; α = .65), acting out (e.g., “acts aggressively”; α = .71), and trauma (e.g., “create games, stories, or pictures about COVID-19”; α = .61). A 4-point Likert scale was used (1 = almost never, 2 = sometimes, 3 = often, and 4 = very often). In Saylor et al.’s (1999) study, the Cronbach’s αs of the scales ranged from .72 to .78. Composite scores were calculated separately for each symptom. Higher scores indicated more symptoms of emotional distress.

Household Chaos

Primary caregivers rated the chaos and confusion in their families from the start of the pandemic using the Chinese version of the Confusion, Hubbub, and Order Scale (CHAOS): Short Form (Matheny et al., 1995). The Chinese version contained five items
rated on a 5-point Likert scale (1 = definitely untrue, 2 = somewhat untrue, 3 = neutral, 4 = somewhat true, and 5 = definitely true). It differed from the English version in that one item (‘Usually a television is turned on somewhere in our home’) was removed due to its low factor loading. A sample item in the Chinese version was “You can’t hear yourself think in our home.” Cronbach’s \( \alpha \) was .79 in Matheny et al.’s (1995) study and .70 in this study. Composite scores were calculated. Higher scores indicated higher levels of household chaos.

**Physical Health of the Family**

Primary caregivers rated their own physical health status and that of their child using two items (‘Since 20 January 2020 [the start of the pandemic], how would you rate your overall physical health?’ and ‘Since 20 January 2020, how would you rate your child’s overall physical health?’) on a 5-point Likert scale (1 = excellent, 2 = very good, 3 = good, 4 = fair, and 5 = poor). Composite scores were calculated as an indicator of the physical health of the family. Cronbach’s \( \alpha \) was .91. We reverse-coded the items, so that higher scores indicated better physical health.

**Economic Instability**

Primary caregivers rated their household economic stability on one item (‘How has your monthly household income changed since the start of the pandemic?’) using a 5-point Likert scale (1 = increased a lot, 2 = increased a little, 3 = stayed the same, 4 = decreased a little, 5 = decreased a lot). I reverse-coded the item, so that higher scores indicated greater increases in household income and lower scores indicated greater income reductions.

**Demographic Variables**

Primary caregivers also reported a large pool of demographic variables, including the child’s sex and birth date, family size (i.e., the number of people living in the home), their own marital status, their annual family income in 2019, and the education level and occupation of the child’s mother and father (see online Appendix 1 for the numeric codes of family characteristics). Because strong correlations were observed between paternal and maternal education \( r = 0.73, \ p < 0.001 \) and between paternal and maternal occupation \( r = 0.47, \ p < 0.001 \), the highest education level and the most prestigious occupation in the household were used as indicators of education and occupation, respectively. This decision made it possible to use education and occupation data for almost all family structures, thereby reducing the amount of missing data.

**Data Analysis**

To examine whether primary caregivers perceived increases or decreases in the amount of time spent engaging with their preschool-aged children from the start of the pandemic (RQ1), I computed the average score for each item of the Time Spent by Mothers and Others Scale and the average score for its Factor 1 (i.e., changes in indoor engaged time) and then compared these scores with a specified value of 3 (‘stayed the same’) using a series of one-sample \( t \) tests. A score significantly greater than 3 would indicate perceived increases in engaged time spent on a certain activity, whereas a score significantly smaller than 3 would indicate perceived decreases in engaged time. Cohen’s \( d \)s were calculated to examine whether the increase/decrease was large or not.

To examine whether perceived changes in caregivers’ engaged time with preschool-aged children predicted children’s learning behavior and emotional distress (RQ2), I calculated the zero-order correlations among these variables and estimated a path model. In the model, perceived changes in caregivers’ indoor engaged time and those in outdoor engaged time were regressed on all of the demographic variables (i.e., child’s age and sex, caregivers’ marital status, family size, parental education, parental occupation, and family income in 2019) and pandemic-specific family variables (i.e., financial instability, physical health, and household chaos during the pandemic). Children’s learning behavior and four aspects of emotional distress were regressed on perceived changes in caregivers’ indoor engaged time and outdoor engaged time as well as on all of the demographic and pandemic-specific family variables.

Finally, I conducted a more nuanced, item-by-item analysis of the family correlates and developmental implications of perceived changes in caregivers’ engaged time in individual activities. To do this, I ran the path model described above by replacing the composite of perceived changes in caregivers’ indoor engaged time with the score on each of the five indoor activities (Items 2–6). The data analyses were performed using SPSS 26.0 and Mplus 7.0.

**Results**

**Caregivers’ Perceived Changes in Engaged Time Spent with Their Children (RQ1)**

As shown in Table 1, results from the one-sample \( t \) tests indicate that primary caregivers generally perceived increases in the amount of indoor engaged time with their preschool-aged children but decreases in the amount of outdoor engaged time from the start of the pandemic. As indicated by the effect size (Cohen’s \( d \)), the largest perceived increase in caregivers’ engaged time was in playing with their child indoors, followed by disciplining the child. The effect size for the perceived decrease in caregivers’ outdoor engaged time (i.e., playing with the child outdoors) was also large.

**The Relation of Family Characteristics with Caregivers’ Perceived Changes in Engaged Time (RQ2)**

Table 2 presents the descriptive statistics and intercorrelations among the study variables. As shown in Table 2, perceived changes in indoor engaged time were positively associated with parental education and annual income in 2019. Perceived changes in outdoor engaged time were negatively associated with parental education.

Table 3 and Fig. 1 show the path model described above. As shown in Table 3 and Fig. 1, perceived changes in caregivers’ indoor engaged time with their preschool-aged children were negatively predicted by changes in monthly household income during the pandemic, and positively predicted by family size. Perceived changes in caregivers’ outdoor engaged time were negatively predicted by parental education. That is, primary caregivers were more likely to perceive increases in the amount of time spent engaging with their preschool-aged children indoors when (1) there were more people living in the household and (3) they experienced a greater loss of family income during the pandemic. Primary caregivers were more likely to perceive decreases in the amount of time spent playing with their children outdoors when parental education level was higher. The model explained 4.1% \( (p = 0.006) \) and 3.4% \( (p = 0.013) \) of the variance in caregivers’ perceived changes in indoor and outdoor engaged time with children, respectively.

Finally, the item-by-item analyses of individual indoor activities showed that perceived changes in indoor play time were negatively predicted by changes in monthly household income during the pandemic \( (\beta = −.118, \ p = 0.004) \). Perceived changes in demonstration time were not associated with any demographic or familial characteristics.
variables. Perceived changes in reading and story time were positively predicted by family size ($\beta = .088$, $p = 0.03$) and negatively predicted by household chaos ($\beta = -.075$, $p < 0.05$). Perceived changes in school-work or learning time were positively predicted by family size ($\beta = .089$, $p = 0.03$) and physical health ($\beta = .092$, $p = 0.01$), and negatively predicted by changes in household income during the pandemic ($\beta = -.115$, $p = 0.004$). Perceived changes in disciplining time were negatively predicted by changes in household income during the pandemic ($\beta = -.133$, $p = 0.001$).

The Relation between Caregivers’ Perceived Changes in Engaged Time and Children’s Learning Behavior and Emotional Distress (RQ3)

As shown in Table 2, Table 3, and Fig. 1, perceived changes in caregivers’ indoor engaged time with preschool-aged children during the pandemic were positively associated with children’s learning behavior and negatively associated with their symptoms of anxiety and withdrawal, but perceived changes in caregivers’ outdoor engaged time with children during the pandemic were positively associated with children’s symptoms of anxiety and withdrawal. In other words, primary caregivers who perceived increases in the amount of time spent engaging with their children indoors to a greater extent during the pandemic had children with more positive learning behavior and fewer symptoms of anxiety and withdrawal. In contrast, primary caregivers who perceived decreases in the amount of time spent playing with their children outdoors to a greater extent during the pandemic had children with fewer symptoms of anxiety and withdrawal. No relation was found between perceived changes in caregivers’ indoor or outdoor engaged time with children and children’s symptoms of fear, acting out, and COVID-19-related trauma. The model explained 12.4% ($p < 0.001$), 7.3% ($p < 0.001$), 6.1% ($p = 0.001$), 4.0% ($p = 0.006$), variables. Perceived changes in reading and story time were positively predicted by family size ($\beta = .088$, $p = 0.03$) and negatively predicted by household chaos ($\beta = -.075$, $p < 0.05$). Perceived changes in school-work or learning time were positively predicted by family size ($\beta = .089$, $p = 0.03$) and physical health ($\beta = .092$, $p = 0.01$), and negatively predicted by changes in household income during the pandemic ($\beta = -.115$, $p = 0.004$). Perceived changes in disciplining time were negatively predicted by changes in household income during the pandemic ($\beta = -.133$, $p = 0.001$).

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The Relation between Caregivers’ Perceived Changes in Engaged Time and Children’s Learning Behavior and Emotional Distress (RQ3)

As shown in Table 2, Table 3, and Fig. 1, perceived changes in caregivers’ indoor engaged time with preschool-aged children during the pandemic were positively associated with children’s learning behavior and negatively associated with their symptoms of anxiety and withdrawal, but perceived changes in caregivers’ outdoor engaged time with children during the pandemic were positively associated with children’s symptoms of anxiety and withdrawal. In other words, primary caregivers who perceived increases in the amount of time spent engaging with their children indoors to a greater extent during the pandemic had children with more positive learning behavior and fewer symptoms of anxiety and withdrawal. In contrast, primary caregivers who perceived decreases in the amount of time spent playing with their children outdoors to a greater extent during the pandemic had children with fewer symptoms of anxiety and withdrawal. No relation was found between perceived changes in caregivers’ indoor or outdoor engaged time with children and children’s symptoms of fear, acting out, and COVID-19-related trauma. The model explained 12.4% ($p < 0.001$), 7.3% ($p < 0.001$), 6.1% ($p = 0.001$), 4.0% ($p = 0.006$),
and 1.1% ($p = 0.163$) of the variance in learning behavior, anxiety/withdrawal, fear, acting out, and COVID-19-related trauma of preschool-aged children, respectively.

Finally, the item-by-item analyses of individual indoor activities showed that perceived changes in reading and story time were positively associated with children’s learning behavior ($\beta = .135, p < 0.001$) and negatively associated with their symptoms of anxiety and withdrawal ($\beta = -.133, p < .001$), fear ($\beta = -.100, p = 0.007$) but not acting out or COVID-related trauma. Perceived changes in school-work and learning time were positively associated with children’s learning behavior ($\beta = .137, p < 0.001$) and negatively associated with their symptoms of anxiety and withdrawal ($\beta = -.102, p = 0.007$). Perceived changes in disciplining time were positively associated with children’s learning behavior ($\beta = .145, p < 0.001$) and negatively associated with their symptoms of anxiety and withdrawal ($\beta = -.090, p = 0.02$). Perceived changes in demonstration time were positively associated with children’s learning behavior ($\beta = .128, p < 0.001$). Finally, perceived changes in indoor play time were not associated with any child outcomes.

**Discussion**

The present study set out to examine how primary caregivers in Wuhan perceived the changes in their allocation of engaged time with their preschool-aged children from the start of the COVID-19 pandemic and how these changes were associated with a large pool of family characteristics and the learning behavior and emotional distress of their children. It has yielded important findings about caregivers’ time investments during the pandemic.

**Caregivers’ Perceived Changes in Engaged Time with Preschool-Aged Children during the COVID-19 Pandemic**

Caregivers usually spend larger amounts of time in helping, supervising, teaching, and taking care of younger children (Milkie et al., 2004). Prior research on sociohistorical crises (Bauer & Sonchak, 2017), including the COVID-19 pandemic (Kreyenfeld & Zinn, 2021; Zhou et al., 2020), has documented that they led to greater changes in caregivers’ engaged time with preschool-aged children than older children. It is thus important to study the changes in caregivers’ allocation of engaged time with preschool-aged children during the pandemic.

The finding that primary caregivers in Wuhan generally perceived increases in the amount of time spent engaging with their preschool-aged children indoors from the start of the COVID-19 pandemic is consistent with the study hypothesis. It also adds to evidence from studies in Germany (Kreyenfeld & Zinn, 2021) and the United States (Lee et al., 2021). The finding that the caregivers in this sample generally perceived decreases in their outdoor play time with their preschool-aged children is also consistent with the hypothesis but is contrary to the finding of Lee et al. (2021) that parents in the United States engaged more often in going on walks with their children from the start of the pandemic.

These findings may be explained by the containment measures implemented in Wuhan. The city of Wuhan was placed under strict lockdown during the pandemic. Similar to other cities around the world, Wuhan’s lockdown involved such containment measures as school closures and work-from-home arrangements. These measures forced all Wuhan children and their caregivers to stay at home for 11 weeks between 23 January and 7 April 2020. Even after the lockdown, preschools in Wuhan, including those in this study, did not reopen until September 2020. Although school closures disrupted education and care for children of various ages, they might have been especially challenging for preschool-aged children, who typically do not have strong self-care abilities and often have trouble concentrating and sustaining attention on task (Zhang, 2021). Unlike primary and secondary schools, moreover, preschools were strictly prohibited by the Ministry of Education of China (2020b) from conducting online teaching during school closures. Consequently, nearly all responsibilities of educating and caring for preschool-aged children shifted to their caregivers (Zhang, 2022). These circumstances may explain why the primary caregivers who participated in this study generally perceived increases in the amount of indoor engaged time spent playing, disciplining, and reading to their preschool-aged children. Finally, Wuhan’s lockdown was unique in that almost all residents were prohibited from leaving their residential communities, which may explain why primary caregivers generally perceived decreases in engaged time spent playing with their preschool-aged children indoors.
Among the six indoor and outdoor activities measured in this study, the perceived decrease in engaged time spent on outdoor play and the perceived increase in engaged time spent on indoor play from the start of the pandemic were relatively large. The finding indicates that the containment measures implemented in Wuhan might have largely led caregivers to play with their preschool-aged children indoors rather than outdoors. Notably, however, this study showed that caregivers’ perceived increases in indoor play time were not associated with any positive child outcomes. Furthermore, although perceived increases in reading and story time and school-work and learning time were associated with children’s positive learning behavior and few symptoms of emotional distress (e.g., anxiety and withdrawal and fear), these increases were relatively small. Together, these findings suggest that Wuhan caregivers are in need of assistance in allocating their indoor engaged time with preschool-aged children. I shall discuss this further below.

The Role of Family Characteristics in Caregivers’ Perceived Changes in Engaged Time with Preschool-aged Children

Consistent with the study’s hypotheses, the family’s poorer physical health and higher levels of chaos during the pandemic were related to a lower likelihood of perceiving increases in caregivers’ engaged time spent educating their preschool-aged children. Specifically, caregivers living in households with higher levels of chaos during the pandemic were less likely to perceive increases in engaged time spent reading or telling stories to their children, and caregivers living in families with poorer physical health during the pandemic were less likely to perceive increases in engaged time spent helping children with school work or learning tasks. Both of these family circumstances might have created competing demands on caregivers’ time during the pandemic, such as the demands for household organization and healthcare (Cheng et al., 2021). This may have left caregivers with little time for educating their children. Moreover, if a family member was infected with SARS-CoV-2 or had COVID-19-like symptoms, it would have been natural for the entire family to keep their distance from each other and reduce caregivers’ engaged time to avoid infection. These findings are cause for alarm, given that the COVID-19 pandemic has caused poor physical health among many people and pushed many families into chaos and disorganization (Chong et al., 2020; Zhang, 2022).

Surprisingly, the observed associations between the other family characteristics and caregivers’ perceived changes in engaged time with preschool-aged children were inconsistent with the hypotheses. First, the hypothesis that a large family size and family income instability during the pandemic would be potential barriers to caregivers spending time engaging with their preschool-aged children was not supported. Instead, these family characteristics were found to be associated with caregivers’ perceived increases in indoor engaged time with their preschool-aged children. Specifically, a greater loss of household income during the pandemic was associated with bigger increases in caregivers’ engaged time spent disciplining the child, playing indoors with the child, and helping the child with school work or learning tasks, and a larger family size was associated with bigger increases in reading and story time and school-work and learning time. It is worth noting that Wuhan’s lockdown took place during Chinese New Year, when family members get together to celebrate. This is reflected in the family size observed in this study. Due to the newly implemented two-child policy that replaced the one-child policy in 2016, the vast majority of nuclear families in China typically have a size equal to or fewer than four people (Xinhua News Agency, 2015). The family size of 4.87 indicates that many of the participating children might have been living with relatives beyond their parents and siblings, such as their grandparents, aunts and uncles, at the time of the study. Driven by the Chinese ideology of collectivism, members of an extended family often work together for the benefits of the whole family (Cong & Silverstein, 2012). In particular, intergenerational families with preschool-aged children in China often take it for granted that grandparents should share the responsibility for household chores and childcare (Sun et al., 2019). I thus speculate that grandparents and other relatives in extended families in Wuhan might have been greatly involved in sharing household tasks such as doing chores and grocery shopping, thereby giving primary caregivers more time to engage in educational activities (i.e., reading, telling stories, and helping with school work) with their preschool-aged children. In contrast, primary caregivers who lived in a smaller, nuclear family without any relatives had to manage multiple duties (e.g., chores, jobs, and childcare) during the pandemic, which might have created competing demands on their time (Cheng et al., 2021) and left them with little available time for educating their children. The observed relation between loss of family income and caregivers’ perceived increases in indoor engaged time might be due to the possibility that caregivers who suffered income loss either lost their jobs or worked fewer hours during the pandemic than before it. In the literature, becoming unemployed and working fewer hours have been associated with an increase in caregivers’ time spent engaging with their preschool-aged children (Kendig & Bianchi, 2008; Roeters et al., 2010).

Second, the hypothesis that higher levels of parental education would be associated with caregivers’ perceived increases in engaged time spent with their preschool-aged children during the pandemic was not supported. Rather, the results showed that higher levels of parental education were associated with greater decreases in caregivers’ outdoor play time with their preschool-aged children. In a recent study, the participants with higher levels of education were found to perceive a higher risk of COVID-19 (Wong et al., 2020). Intuitively, caregivers who had a higher education level may have been less likely to go outdoors with their preschool-aged children to avoid potential infection risks.

Third, martial status, parental occupation, and family income in 2019 were not associated with caregivers’ perceived changes in engaged time with their preschool-aged children. This finding suggests that these family characteristics did not produce inequalities or individual differences in primary caregivers’ allocation of engaged time to their children.

Caregivers’ Perceived Changes in Engaged Time in Relation to Preschool-aged Children’s Learning Behavior and Emotional Distress

Consistent with the hypothesis, I found important benefits of caregivers’ increased indoor engaged time with a preschool-aged child for the child’s learning behavior and emotional health during the COVID-19 pandemic. Specifically, greater perceived increases in caregivers’ time spent engaging with their preschool-aged children indoors were associated with higher levels of positive learning behavior and fewer symptoms of anxiety and withdrawal in the children. Spending quality time together at home provides opportunities for communicative exchanges and interpersonal interactions that facilitate positive learning behavior (Hayes et al., 2018). During these exchanges and interactions, caregivers may convey their values or expectations regarding children’s learning and reward children’s positive learning behavior, and children may model their caregivers’ positive learning behavior (Pomerantz & Grolnick, 2017). The observed benefit of indoor engaged time for children’s anxiety and withdrawal might be attributed to the nurturing and supportive context that caregivers’ involvement provides for their children’s socioemotional development (Barger et al., 2019).
Among the five indoor activities measured in this study, caregivers' perceived increases in engaged time in indoor play were not associated with any child outcomes. In contrast, perceived increases in engaged time in the other four indoor activities, especially literacy and educational activities, were associated with preschool-aged children's positive learning behavior and few symptoms of emotional distress. For instance, caregivers' perceived increases in reading and story time were associated with children's positive learning behavior and low levels of anxiety/withdrawal and fear. In prior studies of non-crisis situations, caregivers' engaged time in literacy and educational activities was found to be beneficial for children's learning behavior (Hsin & Felfe, 2014) and emotional health (Del Bono et al., 2016). The present study adds to the literature by revealing similar relations in a public health crisis. These findings are encouraging, given the documented negative impact of the pandemic on the learning behavior and emotional health of children across a wide age range (Rosen et al., 2020).

Inconsistent with the hypothesis, however, greater perceived decreases in caregivers' outdoor play time with their preschool-aged children during the COVID-19 pandemic were associated with fewer symptoms of anxiety and withdrawal in the children. This finding might be due to children's concerns about possible infection when going outdoors with their caregivers. Preschool-aged children might have acquired knowledge about the coronavirus infection through various channels, such as mass media and caregivers' and teachers' instructions. I speculate that these channels might have conveyed to preschool children a message about the risk of catching this coronavirus outdoors, especially considering the fact that Wuhan's lockdown was very restrictive in that almost all people were prohibited from leaving their residential communities (Chong et al., 2020). As such, playing outdoors is likely to have engendered preschool children's insecurity and worries about possible infection, which might explain why more outdoor play time was found to be associated with more symptoms of anxiety and withdrawal in these children.

No relations were found between caregivers' perceived changes in indoor and outdoor engaged time and their preschool-aged children's symptoms of acting out and COVID-19-related trauma. Arguably, these symptoms, especially trauma, are more severe than symptoms of anxiety, withdrawal, and fear. It is likely that quality family time could mitigate the pandemic's impact on mild symptoms of emotional distress but not severe symptoms.

**Limitations and Future Directions**

Although this study represents an important endeavor to examine caregivers' allocation of engaged time to their preschool-aged children during the COVID-19 pandemic, it has several limitations. First, all of the study constructs were reported by children's primary caregivers. This might not only have involved social desirability issues but also might have led to shared method variance, both of which are likely to have biased the results. It would be useful for future studies to use alternative data collection methods (e.g., child assessments, observation) or a multi-informant approach (e.g., involving both primary and secondary caregivers) to replicate the present findings.

Second, the measure of changes in caregivers' engaged time was a newly developed scale. Given the timing of this study and the context of the COVID-19 pandemic, I was not able to collect more validation data. Also, the measure of changes in outdoor engaged time had only one item (i.e., playing outdoors), and its psychometric properties might not be good. However, most children and their caregivers in the city of Wuhan live in condominiums, and the 11-week tough lockdown prohibited them from leaving their residential communities and severely restricted the type of outdoor activities that they were able to engage in during the pandemic. Therefore, it might not be reasonable to measure children's engagement in other outdoor activities such as hiking, playing ball, or riding bikes.

Third, the sample was drawn from Wuhan. As discussed above, Wuhan's situation was unique during the COVID-19 pandemic. The extent to which the present results are unique to samples in Wuhan or universal to all samples in China or even around the world is unclear. In particular, considering that Wuhan's lockdown was much tougher than that imposed in most, if not all, other countries and cities around the world (Chong et al., 2020), caution should be applied in generalizing the results, especially those related to caregivers' outdoor engaged time with children, to different populations. Conditions during the COVID-19 pandemic have not only differed across cities but have also varied among countries and between rural and urban areas. More studies are needed to reveal how caregivers' allocation of engaged time to their children has been affected by the pandemic and is related to children's learning behavior and emotional health in different societies.

Last, this study was cross-sectional in nature and did not allow to examine the prospective or causal relations between the study variables. Moreover, caregivers were asked to retrospectively report the change in the engaged time allocated to their children from the start of the pandemic, which may have introduced confounding factors such as memory distortion. It would be valuable for a longitudinal design to be used in future pandemics to assess the real change before and during the pandemic and the prospective relations between the variables.

**Theoretical and Practical Implications**

The findings of this study have important theoretical implications regarding caregivers' time allocation to their children during a public health crisis. First, this study showed that primary caregivers in Wuhan altered their patterns of time allocation to their preschool-aged children in response to the COVID-19 pandemic and resulting containment measures. This finding joins evidence from studies on COVID-19 in other countries (Kreyenfeld & Zinn, 2021; Lee et al., 2021) and provides strong evidence for the notion of life course theory that sociohistorical events affect family life and the interaction between family members (Bengtson & Allen, 1993; Elder, 1998). More important, the finding that caregivers in Wuhan generally perceived decreases in their outdoor play time with their children is in sharp contrast to Lee et al.'s (2021) finding in the United States. Arguably, the difference might be caused by the differential containment policies implemented in Wuhan versus the United States. Together, these findings highlight the importance of life course theory's principle of time and place (Elder et al., 2003), which emphasizes that the impact of a sociohistorical event on individual and family development varies depending on where the event is experienced. Notably, a place is not merely a location, but ‘space filled up by people, practice, objects, and representations' (Grievyn, 2000, p. 465). Wuhan, the original epicentre of the COVID-19 pandemic, had many people infected with and dying from COVID-19, experienced shortages of medical staff and equipment, and imposed stringent lockdown measures. I speculate that all of these and other social characteristics are the root of the forces that ultimately led to the observed time allocation patterns of caregivers in Wuhan.

Second, the present results showed that family-level characteristics were important sources of individual differences in the perceived change of caregivers' engaged time with their preschool-aged children during the COVID-19 pandemic. Specifically, a large family size and diminished family income during the pandemic were associated with caregivers' perceived increases in indoor engaged time with preschool-aged children, and a high level of parental education was associated with caregivers' perceived de-
creases in outdoor play time with children. Moreover, higher levels of household chaos and family members’ poorer physical health during the pandemic were related to a lower likelihood of perceiving increases in caregivers’ engaged time in literacy and educational activities. These findings are also consistent with life course theory and suggest that the pandemic differentially affected the time allocation patterns of caregivers from different family backgrounds.

Third, this study suggests that the findings of studies on the developmental benefits of caregivers’ indoor engaged time during normal situations can be generalized to the COVID-19 pandemic situation, whilst those related to outdoor engaged time cannot, at least in the context of Wuhan. It is likely that preschool-aged children perceived a high risk of infection when engaging in outdoor activities during the pandemic. If this is the case, time spent engaging in outdoor activities with caregivers is unlikely to have produced positive effects on preschool-aged children’s emotional health; it may instead have harmed these children’s emotional health.

Interestingly, the present findings suggest that a health crisis situation such as the COVID-19 pandemic is potentially beneficial for caregivers’ allocation of engaged time with their preschool-age children. Specifically, the pandemic led caregivers in Wuhan to generally increase the indoor time spent engaging with their preschool-aged children and this additional quality time with caregivers might have mitigated some of the adverse impacts of the pandemic on children’s learning behavior and emotional health. The findings resemble those of recent studies on the effects of the Great Recession (Cano, 2019), the East Japan Earthquake (Kaneko & Noguchi, 2020), and the COVID-19 pandemic (Kreyenfeld & Zinn, 2021; Zhou et al., 2020) on caregivers’ time allocation to young children. Together, these findings seem to suggest that some sociohistorical crises can lead to caregivers’ positive time investment in young children’s development. Moreover, although it appears to be a misfortune that caregivers in Wuhan had no choice but to follow the lockdown rules and decrease outdoor play time with their children, this decrease might in fact have been beneficial to preschool-aged children’s emotional health. Nevertheless, we do not know whether more overwhelming disasters, such as wars, can be equally beneficial for caregivers’ time allocation or not, due to the lack of evidence from previous studies regarding this topic. Finally, it should be noted that even milder sociohistorical crises can have adverse effects on other aspects of caregiver-child interactions, such as increased maternal spanking (Brooks-Gunn et al., 2013) and decreased autonomy support (Bulow et al., 2021).

The findings of this study also have important implications for enhancing preschool-aged children’s learning behavior, reducing their emotional distress, and helping them to navigate the COVID-19 pandemic. According to the findings, it might be wise for parents and caregivers of preschool-aged children to increase their at-home time spent engaging with children in important activities such as reading, telling stories, and doing school-related work during the pandemic. Preschool children may reap the most benefits and demonstrate the most positive learning behavior and emotional health when the time spent on these activities is increased. Additionally, because children whose caregivers perceived greater decreases in outdoor play time exhibited fewer symptoms of anxiety and withdrawal, it may be valuable for parents and caregivers of preschool-aged children who worry about coronavirus infections when going outdoors to reduce outdoor time. Notably, caregivers who live in smaller families and have little support from extended families and who live in families with higher levels of chaos and poorer physical health may have less time available for engaging with their preschool-aged children during the pandemic, and caregivers with a lower level of education tend to spend more time outdoors with their children. Policymakers and social workers should be made aware that these caregivers need more support to learn how to best allocate their engaged time to improve preschool-aged children’s learning behavior and emotional health.

Authorship contribution statement

Xiao Zhang: Conceptualization, Data curation, Funding acquisition, Investigation, Methodology, Project administration, Resources, Formal analysis, Writing - original draft, Writing - revision

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ecresq.2022.03.001.

Appendix

Table S1

| Variable | M (SD) % |
|----------|----------|
| Child characteristics |         |
| Age (months) | 59.07 (12.28) |
| Year of study in preschool | 40.63% |
| First year (junior class) |         |
| Second year (middle class) |         |
| Third year (senior class) |         |
| Sex (numeric code) |         |
| Boy (1) | 52.7% |
| Girl (0) | 47.3% |
| Family characteristics |         |
| Marital status (numeric code; n = 749) | 95.23% |
| Couple (0) |         |
| Single (1) |         |
| Annual income in 2019 (numeric code; n = 575) |         |
| <10,000 RMB or $4,429 (1) | 3.7% |
| 10,000–19,999 RMB or $2,858 (2) | 3.9% |
| 20,000–29,999 RMB or $4,287 (3) | 2.2% |
| 30,000–39,999 RMB or $5,716 (4) | 3.3% |
| 40,000–49,999 RMB or $7,145 (5) | 2.7% |
| 50,000–59,999 RMB or $8,574 (6) | 3.8% |
| 60,000–69,999 RMB or $10,003 (7) | 3.0% |

(continued on next page)
Table S1 (continued)

| High-level professional or administrator | e.g., manager | 5 |
| High-school or occupational degree | 2 |
| Professional or officer | 3 |
| Semitechnical worker | 4 |
| Unemployed, non-technical worker, farmer | 5 |
| Construction worker | 6 |
| Doctoral degree | 7 |
| Parental occupation (numeric code) | 8 |
| Unemployed, non-technical worker, farmer | 9 |
| Construction worker | 10 |
| Bachelor's degree | 11 |
| Master's degree | 12 |
| Associate degree | 13 |

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