



Companionship Patterns and Emotional States During Social Interactions for Adolescents With and Without Siblings

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Abstract

For decades, researchers and the general public have debated whether children without siblings differ from children with siblings in ways that are meaningful for development. One area that is underexplored in the literature on only children versus children with siblings concerns time use and emotional states in alone time and in social interactions. Resource dilution theory and the prior literature suggests that adolescent only children and adolescents with siblings may differ in some social interactions, such as in time with parents, but not in others, such as in time alone, due to offsetting effects or the universality of certain experiences among adolescents. This study tested these arguments by comparing companionship patterns and four emotional states (happiness, sadness, stress, and meaningfulness) among adolescents (ages 15–18) without siblings ($N = 465$) and adolescents with siblings ($N = 2513$) in the nationally representative American Time Use Survey (2003–2017). Relative to adolescents with siblings, adolescents without siblings spent more time alone, similar amounts of time with peers, and more time exclusively with parents. Only children were not as happy when spending time alone and with peers as adolescents with siblings, but their emotions in these settings were not more negative or less meaningful. In most other social interactions, emotional states were similar between adolescents with and without siblings. These findings show that adolescents with and without siblings differed mainly in their companionship patterns within the household and in their levels of happiness when alone and with peers.

Keywords Affect during social interactions · Siblings · Only children · Resource dilution · Family size · Child quality vs quantity

Introduction

Adolescents without siblings may differ from adolescents with siblings in ways that are meaningful for development, including how they spend their time. Throughout the day, adolescents with and without siblings may spend different

proportions of time alone and with others. Children and adolescents with siblings spend a substantial amount of time with their siblings. Approximately 70% of discretionary (non-school) time among 6–12 year-olds is spent with a sibling (Dunifon et al. 2017). Time with siblings declines as children age, but, for those adolescents with siblings, time with siblings remains an important portion of discretionary time, with older adolescents still spending more time exclusively with siblings than with either of their parents (Larson et al. 1996). It is not clear how adolescents without siblings spend time that might otherwise be spent with siblings. Relative to adolescents with siblings, adolescents who are only children may spend more time alone, but could also spend more time with others. Adolescents with and without siblings may also differ in their emotional responses to time alone and in social interactions. Past research establishes that adolescents respond emotionally to those present in social interactions (Kim et al. 2018), but scholars have not evaluated whether emotional responses vary among adolescents by sibship size.

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Comparisons of outcomes between only children versus children with siblings show that only children do not differ markedly from children with siblings in personality domains (Falbo 2012) or in social and interpersonal skills (Bobbitt-Zeher and Downey 2013), but they do differ in other realms of development, such as educational performance (Downey and Condrón 2004) and behavioral problems (Downey and Condrón 2004; McHale et al. 2012). Companionship patterns and emotional states during alone time and in social interactions represent two domains of development where children with and without siblings may differ, but prior research on these issues is virtually nonexistent.

To address this gap, this study employed resource dilution theory to examine how time spent alone and in companionship with others differed for adolescents with and without siblings among a sample of 15–18 year-olds in the nationally representative American Time Use Survey (2003–2017). Additionally, the current study leveraged the American Time Use Survey Well-Being Module to explore how four emotional states (happiness, sadness, stress, meaning) varied between adolescents with and without siblings during alone time and in various social interactions.

Resource Dilution Perspective

The resource dilution framework provides rationales for expected differences in proportion of time spent alone and in social interactions and emotional states during alone time and in social interactions for youth with and without siblings. An extensive theoretical literature on family size beginning with Blake (1981) in sociology and Becker and Tomes (1976) in economics proposes a trade-off between child quantity and quality within a family. The framework continues to drive analyses of differences in development between children with and without siblings, such as cognitive and non-cognitive skill differentials (see Juhn et al. 2015).

The resource dilution model represents child development as a “production function” where parents invest in their children through time and monetary inputs, and investments made by parents affect multiple domains of a child’s development. Parents with a fixed supply of both time and money will invest more resources into only children, whereas resources will be divided and diluted for children with siblings. Parental emotional involvement could also be viewed as a fixed resource that varies by family size. Parenting stress is influenced by the number and spacing of children and decreases the quality of parent-child interactions beyond the effects of decreased time in social interaction (Workman 2017). The resource dilution model therefore implies a quantity-quality trade-off for

children in a family, with each child in a family receiving fewer resources as family size increases.

The resource dilution model has the clearest implications for time spent between parents and children, but does not directly speak to time spent alone and in interactions with others. Applying the resource dilution perspective to time spent alone as well as in non-parental interactions largely hinges on an assumption that parents’ propensity to intervene in their children’s time use companionship patterns will decrease with family size. According to resource dilution theory, when parents have more children their attention is more divided, leaving parents with possibly higher levels of parenting stress, and lower ability to help direct the daily activities of their children. Although adolescents have greater autonomy in choosing with whom to spend time than younger children, there are several reasons to believe that parents still play a role in structuring the time use of adolescents. Parents are spending more time involved with their children in recent decades than in the past (Sayer et al. 2004), and, in the United States, families of all social classes endorse cultural norms of time-intensive, child-centered parenting (Ishizuka 2018). There is also some evidence that parental monitoring of adolescents has increased over time (Collishaw et al. 2012). Even in adolescence, parents of only children may seek to strategically intervene in their children’s time use more than parents of children with siblings.

Past empirical work on resource dilution has focused almost exclusively on long-term outcomes such as adult health and longevity (Baranowska-Rataj et al. 2017), income in adulthood (Black et al. 2005), high school completion and college enrollment in larger families (Angrist et al. 2010), and high school educational attainment among families with one versus two children in China (Li et al. 2008). With the exception of Juhn et al. (2015) who study family size and narrow measures of parental time investments in young children, and Dunifon et al. (2017) who study the presence of siblings and parent time with children under age thirteen, empirical research on resource dilution has not tested the parental time investments that lie at the center of the original theory. Additionally, prior research has not determined how differences in parental time, money, and emotional investments by family size might also relate to other types of time use among children, such as the time that they spend alone or with friends. The resource dilution perspective suggests that the quality of time alone and in interactions, including emotional quality, may also vary among children with and without siblings, but this topic has not been studied. This study thus addresses central aspects of quantity-quality trade-off theories by evaluating key assumptions underlying these models.

Resource Dilution, Companionship Patterns, and Emotional States

Time alone and time in social interactions

Spending time alone is a developmental milestone that most children have achieved by adolescence. Resource dilution suggests that parents will spend more time with adolescent only children and may attempt to structure adolescent only children's time so that they are not alone excessively, but it is not clear if extra time with parents and/or parental investments in time entails adolescent only children being alone less often or as often as adolescents with siblings. Although resource dilution theory lacks clarity in this regard, research on younger children (ages 6–12) shows that only children spend more time alone than children with siblings (Dunifon et al. 2017). Despite adolescents having greater autonomy than younger children, similar patterns may be observed among adolescents. Thus, this study hypothesized that adolescents without siblings would spend more time alone than adolescents with siblings.

The resource dilution theory lays out the clearest expectation for differences between adolescents with and without siblings in their time spent interacting with parents. Resource dilution theory posits that time exclusively with parents is a fixed resource that is spread more thinly across children as family size increases. Based on resource dilution theory, this study hypothesized that adolescent only children would spend more time with their parents than adolescents with siblings. Prior research largely supports this hypothesis. Among younger children, only children spend more time exclusively with parents compared to children with siblings (Dunifon et al. 2017). Additionally, following the birth of a sibling, parents spend less time engaged in activities with children such as reading and homework assistance (Juhn et al. 2015) because their attention is now divided further.

Having a sibling or not may also alter time spent in interactions with non-household adults and children. Resource dilution theory suggests that family size is a quality versus quantity trade-off. Based on resource dilution, parents of only children may exert more effort encouraging their children to spend more time with relatives, mentors, and friends, as a way to support healthy development. Additionally, for adolescents with siblings, frequent and regular time spent with siblings may crowd out opportunities to socialize with non-household adults and peers. Although past research highlights that at younger ages there are no differences in time spent with adults and children who live outside the household between those with and without siblings (Dunifon et al. 2017), this may not be the case in adolescence. This study thus hypothesized that adolescents without siblings would spend more time with

non-household adults and children, including peers, neighbors, and mentors.

Emotional responses to time alone

Spending time alone may be positive or negative for adolescents, depending on situational contributors. Adolescents increase in their affinity for solitude as they age, and beginning in adolescence, time alone can have a positive effect on emotional states by facilitating freedom, creativity, introspection, and spirituality (Long and Averill 2003). However, time alone may be negative for development when characterized by sensory deprivation, social isolation and confinement, resulting in stress and maladaptation (Gilmartin et al. 2013), and depressive symptoms (Hall-Lande et al. 2007).

Resource dilution does not directly speak to anticipated differences in how adolescents with and without siblings feel during time spent alone. On the one hand, the quality versus quantity trade-off aspect of the theory suggests that parents of only children may ensure that their children's experiences during time alone are not excessively negative. Additionally, if adolescents without siblings do spend more time alone, it may be a more familiar and comfortable situation. Thus, it is possible that children without siblings will have more positive and less negative emotional states when alone. On the other hand, adolescents with siblings may find alone time to be harder to achieve. Given that adolescents increase their preferences for alone time as they age (Long and Averill 2003), those with siblings may particularly enjoy alone time because it allows them to be away from their siblings. Thus, adolescents with siblings may have more positive and less negative emotional states when alone. Because of these possibilities, the current study offered no formal hypothesis regarding emotional states when adolescents were alone, but asked the question of whether those states differed for those with and without siblings.

Emotional responses to companionship

Research studying emotional responses during social interactions establishes that who an adolescent spends time with influences how adolescents feel (Kim et al. 2018). Resource dilution does not directly speak to emotional states during social interactions, but suggests that parents of only children and adolescent only children themselves may structure their time so that they have more positive and meaningful experiences with non-siblings.

Resource dilution asserts that interactions between parents and adolescent only children should be of higher quality than interactions between parents and adolescents with siblings. For emotional states, higher-quality parent-

child interactions could entail happier, more meaningful, and less stressful interactions. Falbo (2012) asserts that there are stronger parent-child relationships among only children, which may result in more positive affect during social interactions with parents. Social comparison processes could also generate more negative social interactions for children with siblings, compared to children without siblings, especially during time spent with parents. Parents often interpret the behavior or attitudes of one sibling in contrast to their other children (for example, see Jensen et al. 2018), and comparisons and differences in treatment between siblings have implications for family relationships (Kowal et al. 2004) and well-being (Rolan and Marceau 2018). If time with parents engenders comparisons with siblings, then parent-child time could be more negative for adolescents with siblings. While past work suggests that as youths transition into adolescence, emotional states when spending time with family members become less positive (Collins and Steinberg 2006), little is directly known about how the presence or absence of siblings influences emotional states when with parents. Based on resource dilution theory and the relevant literature, however, this study hypothesized that time with parents would be more positive, less negative, and more meaningful for adolescent only children versus adolescents with siblings.

Traditional resource dilution theory is less clear about expected emotional states during social interactions with peers. An alternate view, termed resource augmentation, speaks to sibship size and developmental influences (Osmanowski and Cardona 2016), and can offer insights into how emotional states may vary among adolescents with and without siblings during social interactions with peers. Resource augmentation posits that siblings might not always compete for scarce time resources, and the presence of siblings may in some cases contribute to youth development in positive ways because siblings may contribute additional resources to the family. For example, siblings may serve as care providers (Wikle et al. 2018), and models of good academic efforts (Wang et al. 2019) and conduct (Solmeyer et al. 2014). In this vein, past work has suggested that positive sibling relationships are positively associated with positive peer relationships in adolescence (Yucel and Downey 2015), in part because children with siblings are socialized in how to maintain positive relationships with similarly aged peers. Although not all sibling relationships are positive, it is possible that adolescents with siblings, as compared to those without, will tend to have more positive emotional states when interacting with peers because of the greater amount of time spent interacting with siblings. Based on the tenets of resource augmentation, this study therefore hypothesized that time with peers would be more positive, less negative, and more meaningful for adolescents with siblings versus adolescents without siblings.

Prior research suggests that adolescents report more positive affect when with non-household adults compared to when with parents (Kim et al. 2018), but does not compare emotional states between children with and without siblings who spend time with non-household adults. If resource dilution is salient, then adolescent only children may have more positive interactions with non-household adults than adolescents with siblings for two reasons. First, if they are accustomed to interacting more often and more positively with parents, then adolescent only children could be more comfortable interacting positively with other adults. Second, resource dilution suggests that parents with one child will invest more in promoting positive child outcomes, and these efforts may include fostering positive interactions with other adults. Parents may encourage only children to spend time with supportive adults, which may result in more positive and less negative emotional states of these adolescents when interacting with non-household adults. For these reasons, this study hypothesized that time with non-household adults would be more positive, less negative, and more meaningful for adolescent only children versus adolescents with siblings.

Differences in Time Use by Sibship Size: Compositional and Contextual Factors

There are several compositional and contextual factors to take into account when examining time use among adolescents by sibship size and their corresponding emotional states. Observed differences in companionship patterns and emotional states between adolescents with and without siblings could be due to compositional differences between these groups and/or to other individual and household factors that may be correlated with time use. These factors include age, given that autonomy increases as adolescents age (Guisinger and Blatt 1994), gender, considering prior work on differences in peer relationships between adolescent girls and boys (Helsen et al. 2000), and school enrollment, which affects time available for socialization. Socio-economic class influences children's time use through parenting behaviors (Lareau 2012), making it important to account for family income. Similarly, household characteristics related to socialization opportunities, such as living with or without a biological father, also need to be taken into account. In general, African American and Latino/a families have more cohesive extended family and social networks than non-Latino Whites (Smetana et al. 2006), suggesting a need to control for race/ethnicity. Finally, certain activities may be more or less enjoyable, thus having differential impacts on reported affect (Crouter et al. 2004), making it necessary to account for activity type to separate out the effect of the companion on emotional state from the potentially confounding impact of the activity itself.

The Current Study

Prior studies of adolescents have not determined whether adolescent only children spend different amounts of time alone and in companionship as adolescents with siblings, and whether these two groups show different emotional states when they are alone and in companionship with others. Understanding differences in adolescent companionship patterns and emotional states by sibship size is important, because time-use patterns and emotional states have implications for development and well-being (Ramsey and Gentzler 2015). The primary aim of this study was to determine whether adolescents without siblings differed from adolescents with siblings in the amounts of time that they spent alone and with others (parents, peers, mentors, etc.) and whether they differed along four emotional states (happiness, meaning, sadness, stress) when spending time alone and with others.

Drawing from resource dilution theory, the study tested seven hypotheses and research questions using data from the American Time Use Survey. Because only children do not have siblings, and based on past research (Dunifon et al. 2017), adolescents without siblings would spend more time alone than adolescents with siblings. Based on principles of resource dilution positing that parental time is a fixed resource that will decrease with family size, adolescent only children would spend more time with their parents than adolescents with siblings. Because parents with only one child may have more time to shape their children's time use, adolescents without siblings would spend more time with non-household adults and children, including peers, neighbors, and mentors. Based on the potential for adolescent only children and children with siblings to feel positively during alone time, emotional states during time spent alone would not differ significantly by the presence or absence of siblings. Based on the resource dilution principle that only children will spend more time with parents and subsequently build stronger relationships with them (Falbo 2012), time with parents would be more positive, less negative, and more meaningful for adolescent only children versus adolescents with siblings. Based on the notion that adolescents with siblings have more socializing experience, and due to resource augmentation associated with having siblings, adolescents with siblings would report more positive, less negative, and more meaningful emotional states when interacting with peers. Because parents of only children may be better able to promote positive experiences for their children with non-household adults through resource dilution, adolescents without siblings would report more positive, less negative, and more meaningful emotional states when interacting with non-household adults. The analyses included several compositional and contextual factors as control variables to minimize omitted variable bias,

including age, gender, school enrollment, socioeconomic class, household family structure, race/ethnicity, and activity patterns.

Methods

Participants

The study relies on data from the American Time Use Survey (Hofferth et al. 2018) to explore adolescents' time alone and in social interactions and their emotional states during time spent alone and with others. This data set offers several advantageous features for this research. The data are nationally representative, allowing research to move beyond small, homogeneous samples found in psychological research to explore a broad view of differences in social interactions among adolescents who are only children versus those with siblings. The panel nature of the data also allowed for adjusting for unobserved heterogeneity, such as preferences for being alone or in companionship.

The American Time Use Survey is a time diary study of Americans beginning in 2003 and continuing annually. The U.S. Census Bureau administered the survey in connection with the Current Population Survey (CPS). A phone interview lasting about 30 min documented an individual's time use over a 24-hour period, from 4 a.m. of the previous day until 4 a.m. of the interview day. Respondents accounted for all time throughout the day (Hamermesh et al. 2005). Interviewers used the Day Reconstruction Method and computer assistance to elicit high-quality recall and accuracy (Kahneman et al. 2004), and for each primary activity throughout a day, respondents reported who else was present. The surveyors collected data for each day of the week, although they oversampled weekends. Sampling weights provided by the American Time Use Survey correct for sample non-response, oversampling of weekends, and ensure that average time use is representative of the United States' national population. Participants came from every state within the United States and Washington, D.C. The analysis pooled data from 2003 to 2017 and restricted the sample to adolescents who were between ages fifteen and eighteen who were not married or parents. The youngest age of survey participants is fifteen years old.

In order to determine whether an adolescent was a singleton, data in the American Time Use Survey were linked to fertility information about the mother in the adolescent's household, found in the Current Population Survey prior to the time diary interview. Sampling at the household level for the Current Population Survey was random, suggesting no correlation between having a mother in the fertility supplement and being a singleton. Validation of the sample linking revealed high quality matching. Any adolescent

without a linked mother was dropped, resulting in a nationally representative sample of singletons. A caveat worth noting is that the approach necessarily dropped adolescents living without a mother figure in their households. In 2017, approximately 96% of children under age 18 were living with a mother figure in the household (Livingston 2018), so the sample is largely representative of most children. Some singletons may have been living with a step-mother or an adopted mother who had one child living in another household. A very small percentage (<1%) of the sample of singletons were living with stepmothers, so the degree of bias presented by these cases is negligible. Some singletons living with mothers may also have had half-siblings living in other households (i.e., non-household father's children with a different mother), although this number is also likely small, and these adolescents may be treated like the only child in the household. The final sample included 2978 adolescents (ages 15–18). In years 2010, 2012, and 2013, 477 adolescents answered questions about emotional states during activity/companion experiences, and emotional responses for this subset of adolescents were evaluated. Table 1 provides a demographic overview of the sample as a balance table, split by whether an adolescent was an only child or not. These samples look quite similar on all measures except for family structure measures; only children were less likely to live in a household with two parents compared to adolescents with

siblings, and only children unsurprisingly had fewer children living in the home. The analysis controlled for these family structure differences in the multivariate estimation.

Measures

Presence of siblings

Only children ($N = 465$) were identified as being the only child living in a household and having a mother who reported having only one birth in a prior CPS survey. This measure makes no distinction between adopted mothers, step-mothers, and biological mothers, and a few of the adolescents classified as singletons may have in reality had a step-sibling or half-sibling/s living elsewhere. Adolescents with siblings ($N = 2513$) were any respondent whose mother reported having more than one birth or living in a household with at least one other child. The focus remained on singletons to remain comparable to current literature comparing youths with and without siblings. An alternative view would be to study “only children in the household” as companionship patterns may depend on opportunity to interact with family. However, resource dilution may be salient to youths with siblings living elsewhere to the extent that parents remain involved with non-household children.

Social interactions and time alone

To measure social interactions, information reported by the adolescent about who was present throughout the day was used. Measures were based on the total number of minutes within a 24-hour period that a respondent reported spending with a particular companion type or alone, and measures made no distinction about how many separate spells occurred through the day. For privacy reasons, the survey did not collect companionship information when an adolescent was asleep or during personal grooming activities. Alone time was defined as total waking time an adolescent reported being with no other people. Time with parents was measured two ways. First, total time with parents measured all interaction time with parents, and this time could have been shared with other people, including siblings or non-household members. Second, time with parents and no other people measured adolescent interactions exclusively with parents and no other people present to isolate time where parents were likely focused on the adolescent. Time with household siblings was also measured two ways. First, total time with siblings measured all interaction time with siblings, regardless of who else was also present. Second, time with siblings and no others measured time spent exclusively with household siblings and no other people. Time with non-household adults included the cumulative time with adult relatives (non-resident parents, grandparents, adult

Table 1 Household and individual demographics^a

Variables	Adolescents without siblings ($N_1 = 465$)		Adolescents with siblings ($N_2 = 2513$)	
	Mean	Std. Dev.	Mean	Std. Dev.
Age	16.2	0.8	16.5***	1.1
Enrolled in school	0.93	0.2	0.90	0.3
White	0.59	0.5	0.58	0.5
Black	0.16	0.4	0.13	0.3
Hispanic	0.17	0.4	0.24	0.4
Household income:				
Less than \$40,000	0.22	0.4	0.22	0.4
\$40,000–\$100,000	0.53	0.5	0.49	0.5
Over \$100,000	0.30	0.5	0.34	0.5
Lives in non-metro area	0.19	0.4	0.14	0.3
Family structure:				
Two-parent family	0.66	0.5	0.77***	0.4
Mother only family	0.33	0.5	0.21***	0.4
Number of children	1	0	2.2***	1.1

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

^aSignificance of two-sample unpaired *t*-tests with unequal variances comparing adolescents without siblings to adolescents with siblings

Table 2 Adolescents' emotional state—descriptive statistics^a

Variable	Full sample ($N_1 = 1413$) ^b		Only child respondents ($N_2 = 250$)		Respondents with siblings ($N_3 = 1163$)	
	Mean	SD	Mean	SD	Mean	SD
Meaningfulness	3.38	2.00	3.20	2.05	3.42	1.99
Happiness	4.19	1.53	4.12	1.60	4.20	1.52
Sadness	0.46	1.11	0.44	1.09	0.46	1.11
Stress	1.15	1.57	1.23	1.62	1.13	1.56

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

^aSignificance of two-sample unpaired t -tests with unequal variances comparing columns 2 and 3 for each row

^bAverages are calculated using up to three activities per adolescent

siblings, uncles, aunts, and other related adults), neighbors, mentors, and other adult acquaintances, and interactions were included even if people in other categories were also present. Time with non-household relatives under age 18 was measured regardless of who else was present, as was time with friends (as categorized by the respondent). Some models used a measure of time with non-sibling youth, including child relatives and friends. A measure of total time with youth included time with siblings, child relatives, and friends. Time with others not previously accounted for in the categories mentioned was measured, and this category most often measured school, work or other large group settings. Dichotomous variables were also constructed to measure the extensive margin of whether a respondent spent any time with a companion/group.

Adolescent emotional states during social interactions and time alone

The study used three dimensions of emotional states and an indicator of meaningfulness to measure adolescents' emotional responses during social interactions and time alone. A subset of 477 respondents in the sample answered the following questions for up to three activities: (a) How meaningful did you consider what you were doing [to be]? (b) How happy did you feel during this time? (c) How sad did you feel during this time? (d) How stressed did you feel during this time? For each question, the respondents chose their answers from a scale of 0 (e.g., *not happy at all*) to 6 (e.g., *very happy*). These questions mirror some components of the Princeton Affect and Time Study (Krueger et al. 2009) and the European Social Survey (OECD 2013). Three of the four measures (happiness, sadness, and stress) also align with Russell's (2003) conceptualization of emotions. Russell explained core affect along two independent dimensions: the positive/negative dimension and the high/low arousal dimension. Russell characterized emotions as

one of four types: positive high arousal (e.g., happiness), positive low arousal (e.g., contentment), negative high arousal (e.g., stress), or negative low arousal (e.g., sadness). Emotional response indicators in the American Time Use Survey measure happiness, stress, and sadness, but there is no measure of contentment. However, the survey also included meaningfulness, allowing for an evaluation of how interactions provided meaning independent of the three emotional states measured. Table 2 summarizes these measures. No differences in average emotional states were observed between youth with and without siblings.

Sociodemographic characteristics, activity, location, and timing controls

Individual and household sociodemographic characteristics were measured. Age (in years) was measured as a continuous variable. Dichotomous variables indicating additional demographic variables were also measured (Enrolled in School: 0 = respondent is not enrolled in school, 1 = enrolled; White, non-Hispanic: 0 = not white or is Hispanic, 1 = white and non-Hispanic; Black, non-Hispanic: 0 = not Black or is Hispanic, 1 = Black and non-Hispanic; Hispanic: 0 = not Hispanic, 1 = Hispanic; Low-income household: 0 = household income is greater than \$40,000 in 2016 dollars, 1 = household income is below \$40,000; South: 0 = does not live in the South, 1 = lives in the South; Midwest: 0 = does not live in the Midwest, 1 = lives in the Midwest; West: 0 = does not live in the West, 1 = lives in the West; Metro Area: 0 = does not live in a metropolitan area, 1 = lives in a metropolitan area; Female: 0 = not female, 1 = female; Lives with Father: 0 = does not reside with biological or adopted father, 1 = resides with biological or adopted father). A respondent's contemporaneous activity was captured in activity binary variables (At school: 0 = respondent was not at school, 1 = respondent was at school; At work: 0 = respondent was not at work, 1 = respondent was at work; Performing housework: 0 = respondent was not performing housework, 1 = respondent was performing housework). A location control indicated whether or not an activity occurred at a respondent's home or yard. Timing controls included survey year, month, day of the week, and time of day.

Analytic Approach

Missing data

The survey provided high quality data with minimal missing data; however, one variable indicating whether an adolescent lived with their biological/adoptive father was missing for 1124 adolescents. The missing values all occurred prior to 2008. Most household and demographic

characteristics balanced when splitting the sample by whether or not father's presence in the household was missing. Hispanics and adolescents from low-income homes were slightly more likely to have missing values, and all other household and demographic characteristics showed no difference between adolescents with missing and included values. Little's test of missing completely at random passed for all demographic variables except low-income and Hispanic adolescents, suggesting that listwise deletion was not appropriate and multiple imputation was needed. The analysis used multiple imputation with chained equations (with 100 imputed datasets) to account for missing information in the sample. As a robustness check, the model was also estimated using data from years 2008–2017, when missing values were not an issue. All analyses were conducted in Stata 15.1 using the MI suite of commands.

Social interactions and time alone

To analyze interactions and time alone among adolescents, the study modeled the duration of contact an adolescent had with companions. The analysis first tested for differences using independent means significance testing on companionship patterns between the samples of adolescents with and without siblings. Independent sample means t-tests were calculated to determine the difference between the samples, as the samples in each pair were mutually exclusive (Larsen and Marx 2012). Inferences were made based on several critical values using two-tailed tests. Next, bivariate correlation analysis tested associations between being an only child and companionship patterns (Wackerly et al. 2008). Inferences were made based on a critical value of 0.05 using two-tailed tests.

Ordinary Least Squares (OLS) regression analysis was conducted to analyze minutes per day spent with companion types, controlling for demographic characteristics of the respondent. Each companion type was estimated as a separate dependent variable. The companion categorizations were not mutually exclusive. The analysis represented the minutes per day person i spent with companion type j as the dependent variable.

$$C_{ij} = \beta_0 + \beta_1(OnlyChild_i) + X\Gamma + \epsilon_{ij}$$

OLS estimates of linear models show greater robustness than Tobit estimates when non-participation is caused by the fact that time diary surveys sample days rather than longer time horizons (Stewart 2013). The omitted base group was adolescents without siblings, and all estimates were made in comparison to adolescents with siblings. The matrix X contained sociodemographic, location, and timing controls.

Adolescent emotional states during social interactions and time alone

To explore how adolescents feel as they engage with others, bivariate correlation analysis was used to measure associations between emotional states and companionship. Inferences were made based on a critical value of 0.05 using two-tailed tests.

The analysis then took advantage of the multilevel nature of the data. Rather than focus on absolute emotional state rankings, the analysis measured emotional state for each adolescent during activities of interest relative to reports of his or her own feelings when in different contexts. Because the data set consisted of three activities and emotional evaluations per individual, a random effects panel model (sometimes called multilevel or mixed model) was used. Random effects models transform variables using a weighted average of within-level and between-level estimates in order to correct for individual-level serial correlation. By transforming variables, the random effects model produces consistent coefficient estimates by adjusting for the nesting of emotional state reports at the individual level. Thus, the analysis can consistently estimate the effects of social interactions on adolescent emotional states in this framework (Wooldridge 2016). An advantage of this model is the model's ability to estimate invariant individual characteristics. The analysis conceptualized the basic model in matrix form as follows:

$$y_{ij} = \beta_0 + \beta_1(OnlyChild_i) + \beta_2 \cdot Companion_{ij} + \gamma \cdot (2\text{ way interactions}) + X\Gamma + \alpha_i + \epsilon_{ij}$$

Emotional state for adolescent i in context j was used as the dependent variable. The Only Child binary variable separated the sample by sibling status (Only Child: 0 = no, 1 = yes). The companion vector contained binary variables indicating whether companion type j was present at the time of the emotional state measure. The analysis treated alone time as the base case, and all companionship estimates were made in relation to emotional state when alone. The companionship categories were not mutually exclusive as an adolescent may have reported being with multiple companions at the same time. The two-way interactions vector contained interactions between the only child binary variable and companion variables. These interactions allowed for different responses to social interactions among those with and without siblings. All cells had more than 20 observations, needed to detect effects (Harrell 2015). The matrix X contained sociodemographic, activity, location, and timing controls to control for demographic and activity characteristics that potentially confound associations with emotional states. For reference, the model capturing emotional state was also estimated as a model with no

interaction terms, only using the main effects, and estimates are reported as well. Sensitivity analysis for the random effects model was conducted using a fixed effects model relying solely on within-person variation and a Hausman test was used to evaluate the appropriateness of the model specification.

Results

Social Interactions and Time Alone

Descriptive statistics and bivariate correlations

Table 3 presents descriptive statistics with information on differences in shared time with companions between adolescents with and without siblings. Raw average differences showed that adolescents without siblings spent an average of 237 min alone each day while adolescents with siblings spent 206 min alone. Adolescents without siblings spent an average of 171 min per day with household members while adolescents with siblings spent 222 min per day. Adolescents without siblings spent 144 min with their mothers, which was 27 min more than adolescents with siblings. All adolescents spent similar time with their fathers. Adolescents without siblings spent 85 min exclusively with

parents, nearly double the 45 min of exclusive time with parents reported by adolescents with siblings. Adolescents with siblings spent 160 min with their siblings, and 46 min of that time was exclusively with siblings.

The upper panel of Table 4 reports bivariate correlations between companionship patterns and model covariates. Bivariate correlation analysis reveals that being an only child was positively correlated with the amount of time an adolescent spent alone. Being an only child was positively correlated with spending time with others and strongly correlated with spending exclusive time with parents. The bivariate correlation between being an only child and the amount of exclusive time spent with parents was 0.46 and was statistically significant at the five percent level. Being an only child did not correlate with the amount of time spent with non-household adults. Being an only child also did not correlate with the time spent with non-sibling peers such as cousins and friends. Being an only child negatively correlated with time spent with any children under age 18, including child relatives, friends, and siblings.

In summary, descriptive results show interesting differences in time with parents, time with siblings, and time alone. Only children spent more time alone compared to children with siblings. Adolescents without siblings had more exclusive time with their parents. Trivially, children with siblings spent more time with siblings and more

Table 3 Incidence and duration of activity companions^a

Companions	Only children ($N_1 = 465$)		Adolescents with siblings ($N_2 = 2513$)	
	Mean time ^b	SD	Mean time	SD
Alone	237.1	186.0	205.5**	179.0
Any household member	171.2	187.6	221.6***	216.1
Mother (only or with others)	143.6	174.2	116.5**	162.8
Father (only or with others)	82.3	151.6	80.2	147.5
One or both parents with others	167.4	187.9	141.8*	180.0
One or both parents only (without others)	85.3	127.1	45.0***	92.7
Household sibling/s (only or with others)	0	0	160.4***	204.1
Household sibling/s only (without others)	0	0	45.5***	91.2
Any non-household member	258.7	238.0	241.3	234.8
Adult relatives (only or with others)	37.2	108.3	30.6	99.2
Child relative (only or with others)	23.9	85.6	18.8	81.2
Mentor adults (only or with others)	35.4	73.4	32.3	74.5
Adult acquaintances (only or with others)	8.6	59.3	9.4	52.8
Friends (only or with others)	134.3	203.5	145.2	207.5

* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$

^aSignificance of two-sample t -tests with unequal variances for time spent. Being an only child is the base of comparison in all tests

^bTime is measured in minutes per day, and averages are not conditioned on having interaction in the day with the companion type

Table 4 Bivariate correlations of the variables included in the companionship and emotional state analyses

Variables	Companionship (<i>N</i> = 2978)					
	Alone	Parent(s) with or without others	Parent(s) without others	Non-household adult	Children (not siblings)	Children (any)
Only child	0.06*	0.05*	0.46*	0.02	0.02	−0.15*
Age	0.10*	−0.04*	0.04*	0.06*	−0.02	−0.07*
Female	−0.05*	0.09*	0.04*	0.02	0.01	0.02
Black	0.02*	−0.08*	0.00	−0.03	−0.02	−0.01
Hispanic	−0.06*	−0.01	−0.04*	−0.04*	−0.07	0.01
Low income household	−0.05*	−0.02	0.02	−0.02	−0.07*	−0.05*
Lives with biological father ^a	−0.03	0.11*	−0.04	−0.02	−0.01*	0.03
In high school	−0.06*	−0.04	−0.04*	−0.09*	0.03	0.06
Metro area	0.07*	−0.07*	−0.03	−0.05*	−0.05*	0.00*
Lives in the Midwest	−0.02	−0.03	0.02	0.00	0.07*	0.46
Lives in the South	−0.01	0.03*	0.04*	0.03	−0.01	0.51
Lives in the West	−0.03	0.00	−0.03	−0.02	−0.02	0.10
Year ^b	−0.05*	0.07*	0.02	−0.04	−0.19*	−0.15*
Weekday ^c	0.03	−0.25*	−0.05*	−0.09*	−0.03	−0.14*

Variables	Affect (<i>N</i> = 1413)			
	Meaning	Happiness	Sadness	Stress
Only child	−0.10*	0.01	0.03	0.00
Parent(s) w/ or w/o others	0.03	0.05	0.02	−0.09*
Parent(s) without others	−0.03	−0.01	0.02	−0.05*
Non-household adults	0.11*	0.05	0.04	0.02
Children (not siblings)	0.10*	0.20*	−0.04	−0.12*
Others	−0.01	−0.05	−0.02	0.12*
At school	0.13*	−0.16*	−0.00	0.34*
At work	−0.02	−0.05	0.07*	0.01
Performing housework	0.04	−0.02	0.00	−0.00
Age	−0.01	−0.01	−0.04	−0.10*
Female	0.03	−0.02	0.02	0.11*
Black	−0.05	0.04	−0.03	−0.14*
Hispanic	0.01	0.01	0.04	−0.05
Low income household	−0.03	0.00	0.05*	−0.02
Lives with father ^a	0.06*	0.01	0.03	0.08*
In high school	0.02	0.01	0.04	0.12*
Metro area	0.00	0.05*	−0.02	−0.02
Lives in the Midwest	0.01	−0.02	0.01	0.07*
Lives in the South	−0.08*	0.01	−0.08*	−0.08*
Lives in the West	0.07*	0.03	0.06*	0.03*
Year ^b	0.11*	0.03	0.03	0.08*
Weekday ^c	0.03	−0.09*	−0.01	0.18*
Hour of the day ^d	−0.04	0.03	−0.05*	−0.17*

**p* < 0.05^aListwise deletion^bCorrelation model does not include year fixed effects for each year whereas regression analysis in Tables 5 and 6 does^cCorrelation analysis does not include day fixed effects for each day whereas regression analysis in Tables 5 and 6 does^dCorrelation analysis does not include hour fixed effects for each hour of the day whereas regression analysis in Table 6 does

exclusive time with siblings. Minimal differences were found in how adolescents interacted with non-household companions.

Results from the estimated model

The results from an OLS regression measuring differences in time spent with various companions are shown in Table 5, with the reference group referring to adolescents with siblings. Adolescents without siblings were alone 40 min more per day than adolescents with siblings. Despite spending more time alone, adolescents without siblings spent twenty-six more minutes with their parents compared to adolescents with siblings, regardless of who else was present. To be sure, relative to youth with siblings, only children spent an estimated 126 min more per day having time with only one or both parents and no other people. Only children spent similar amounts of time with non-household adults and non-household children, such as cousins and friends.

Sensitivity analysis

Several sensitivity tests provided checks for the robustness of findings to model specification and measurement definitions. These tests deepen support for the main model and results. As a robustness check on the multiple imputations model, missing values were instead dropped using listwise deletion, and results are reported in Supplemental Table 1 in the online appendix. Further, the model was estimated using data following 2008, since households were equally likely to be sampled before or after 2008 and all missing observations were prior to 2008. These results are found in Supplemental Table 2 in the online appendix. Results were qualitatively similar with minor adjustments to minutes estimated, although model precision in both sensitivity tests declined as expected when estimating with smaller samples. Next, estimates focusing on extensive margin measures of companionship (indicating whether or not an adolescent interacted with a companion type on the sample day) were conducted to relax the assumption of linearity in the

continuous minutes per day measures. Results are presented in Supplemental Table 3 in the online appendix. The model resulted in the same pattern of findings, although interpretations were slightly different considering the adjustment to the dependent variable definition.

The analysis included a sensitivity test on the sample selection criteria. Some adolescents with siblings may be the only child in their household due to being the youngest child or having siblings living elsewhere for a variety of reasons. These adolescents may be similar to singletons in terms of their lived experience and companionship interactions. Resource Dilution may be salient to youth with older siblings living elsewhere to the extent that parents shift attention to the remaining child in the house in a similar way to parents of only children. Opportunities to socialize may be more dependent on household configuration than on global sibships. On the other hand, only children versus youngest children with older siblings outside the home were likely socialized differently growing up, which could have had lasting influences on patterns of time utilization in adolescence. As an alternate approach, the only child group was defined as “only child in the household,” which added 61 additional adolescents to the group of true singletons. Results of this analysis are presented in Supplemental Table 4 in the online appendix. Social interaction patterns of only children in their household were remarkably similar to patterns of singletons, suggesting that household configuration may be more important for resource dilution on parents’ time rather than global family relationships and family size.

Adolescent Emotional States during Social Interactions and Time Alone

Bivariate correlations

The lower panel of Table 4 reports bivariate correlations between emotional state measures and model covariates. Bivariate correlation analysis reveals that being an only child negatively correlated with the level of activity meaning reported, with a correlation of $p = -0.10$, which was

Table 5 OLS estimates of the duration with different companions by sibling structure ($N = 2978$)^a

Variables	Alone	Parent(s) with or without others	Parent(s) without others	Non-household adult	Children (not siblings)	Children (any)
Only Child	40.3*** (10.6)	25.8* (10.8)	125.8*** (8.7)	14.9 (9.5)	8.4 (12.6)	-119.5*** (12.9)
Intercept	9.9 (79.4)	402.3*** (69.5)	-60.7* (29.6)	94.0 (74.7)	312.9** (91.5)	747.7*** (98.9)
R^2	0.06	0.12	0.23	0.04	0.09	0.11

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

^aAll regressions include companion, location, and timing controls. The base responder type is an adolescent with siblings. Models control for sex, race/ethnicity, income status, enrollment in school, region, metropolitan status, employment status, and family structure. Robust standard errors of coefficient estimated reported in parentheses below estimates

statistically significant at the five percent level. This suggests a need to adjust model estimates to account for between-group differences in meaning reports, and the random effects model accounts for this group-level difference in meaning reports. Happiness, sadness, and stress do not correlate with being an only child, suggesting that all adolescents reported similar levels of emotional states across their reports.

Results from the estimated model

Table 6 reports results from random effects regression estimating the effect of spending time with companions compared to being alone on adolescent emotional state, with moderation by sibling structure. The magnitudes of the coefficients for the base model correspond to how much a covariate changed an adolescent with sibling’s emotional state on a 6-point scale compared to being alone. As a reminder, the companionship groups were not mutually exclusive, and all comparisons were in relation to time alone. Differences in adolescent emotional state for only children versus youths with siblings were measured through interaction terms.

Adolescents who were only children showed differences in emotional state compared to youths with siblings only for the domain of happiness. In the domains of meaning, sadness, and stress, however, only children and adolescents with siblings were not statistically distinguishable. Relative to adolescents with siblings spending time alone, only children were less happy when spending time alone. Only children and adolescents with siblings responded similarly to time with parents (either with or without others also present), finding these social interactions to be more meaningful than time alone. Adolescents (with or without siblings) found interactions with non-household adults to be more meaningful and happy than time alone. Relative to adolescents with siblings spending time with other youth, only children were less happy when spending time with other youth and the interaction between spending time with other children and stress was positive for only children, but was not significant. Adolescents also expressed increased happiness in interactions with other non-household individuals, most likely in settings such as school and work.

Sensitivity analysis

Sensitivity analysis was performed on the emotional state model to ensure results patterns were not unique to the model chosen or measurement choices. First, emotional state was examined using a fixed-effects framework, relying on within-person variation to identify differences in emotional state, and these results are presented in Supplemental Table 5 in the online appendix. The fixed-effects model

Table 6 Random effects estimates of companionship and emotional state, adolescents with and without siblings (N = 1413 observations, 477 adolescents)^a

Variables	Meaning	Happiness	Sadness	Stress
Only child	-0.14(0.19)	-0.01(0.14)	-0.03(0.11)	0.08(0.15)
Parent(s) with or without others	0.59***(0.16)	0.20(0.12)	-0.08(0.09)	-0.15(0.11)
Parent(s) without others	-0.15(0.20)	0.03(0.15)	-0.02(0.11)	-0.02(0.14)
Non-household adult	0.53***(0.16)	0.25*(0.12)	-0.05(0.09)	-0.02(0.11)
Children (not siblings)	0.61***(0.13)	0.57***(0.10)	-0.08(0.07)	-0.11(0.08)
Other	0.17(0.16)	0.36***(0.12)	-0.14(0.09)	-0.15(0.09)
Interactions:				
Only child* alone				
Only child* parent(s) with or w/o others	0.72(0.80)	-1.33*(0.61)	0.01(0.43)	0.96(0.57)
Only child* parent(s) without others	0.24(0.81)	-0.45(0.61)	-0.04(0.44)	0.64(0.57)
Only child* non-household adult	0.87(1.02)	-0.80(0.78)	0.05(0.56)	0.03(0.73)
Only child* children (not siblings)	0.69(0.58)	-0.49(0.44)	-0.26(0.32)	0.67(0.42)
Only child* other	0.06(0.74)	-1.13*(0.56)	0.21(0.40)	0.95(0.53)
Intercept	1.82(1.53)	3.79***(1.15)	0.24(0.89)	0.29(0.67)
Overall R ²	0.08	0.10	0.04	0.14

*p < 0.05; **p < 0.01; ***p < 0.001

^aThe base responder type in interaction models is an adolescent with siblings spending time alone, and all coefficients are in relation to the base group. All regressions include activity, location, and timing controls. In addition, models control for sex, race/ethnicity, income status, enrollment in school, metropolitan status, employment status, and family structure. Standard errors of coefficient estimated reported in parentheses below estimates

produced the same key findings with respect to differences in emotional state for only children compared to adolescents with siblings when with companions or spending time alone. A Hausman test detected no statistical difference between the random effects model and fixed effects model, suggesting that estimates are not biased by unobserved differences in individual invariant characteristics. Second, sensitivity to sample definitions was done using a random effects analysis on “only children in the household” rather than focus on singletons. Results in Supplemental Table 6 show results that are qualitatively similar to results using the sample of singletons, likely because very few adolescents were reassigned under the new sample definitions.

Discussion

Prior research studies examining developmental differences between children and adolescents with and without siblings have largely focused on personality and cognitive domains, with a lack of attention to differences in time-use patterns and emotional states during companionship patterns between these two groups. Resource dilution theory suggests that some companionship patterns and emotional states may vary between adolescents with and without siblings, especially time spent with parents, but others may be similar in nature because of offsetting effects for children with and without siblings or because these experiences are similar among adolescents regardless of sibship size. To address these issues, this study analyzed 15–18 year-olds in the nationally representative American Time Use Survey data (2003–2017).

Some findings regarding adolescents’ time use were consistent with expectations, while others were not. Consistent with the hypotheses, only children spent substantially more time alone (around 32 min, on a typical day) than children with siblings. Those with siblings, instead, may have been spending some of the time that could have been spending alone with their siblings; adolescents with siblings spent about 45 min a day together without other household members. This result was consistent with a previous study of sibling presence and time use among younger children (Dunifon et al. 2017).

Adolescent only children spent substantially more time exclusively with parents (with no other companions present) than youth with siblings (over 2 h more time on a typical day). Adolescents with siblings did not get as much exclusive time with parents; they often had others present when spending time with their parents (most often their siblings). This finding is consistent with this study’s hypothesis, which stemmed from the resource dilution perspective, which predicts increasing scarcity of focused one-on-one attention from parents with family size due to

parent time spread across more children. This finding is also consistent with previous research on time use among younger only children (Dunifon et al. 2017).

Even though resource dilution suggests that parents may have more of a role in directing the time that only children spend with individuals outside the household, time spent with peers and adults who lived outside the home (e.g., other adult relatives, mentors) did not vary between adolescents with and without siblings. Adolescents without siblings could have also spent more time with peers or non-household adults than adolescents with siblings as a means to compensate for a lack of sibling time, but perhaps because of their burgeoning independence, adolescents with and without siblings could choose to spend similar amounts of time with friends and non-household relatives. Overall, these results show that the presence or absence of siblings matters mainly for adolescent companionship patterns within the household.

The resource dilution perspective did not provide a clear expectation for the emotions that adolescents with and without siblings would express during their alone time. Thus, a null hypothesis was offered regarding emotional states during alone time, but the data indicated that adolescents who were only children were less happy during their alone time than youth with siblings who spent time alone. There were no differences between adolescents with and without siblings on the three other measures of emotional state (meaning, sadness, and stress) when spending time alone. Compared to children with siblings, only children were alone more often and were less happy when alone, but did not exhibit more negative emotional states when alone (sadness or stress). This result may have three explanations. First, adolescents without siblings could be less happy than adolescents with siblings during their alone time because they spend much more time alone. However, adolescent only children did not express broad negative emotions when alone that could be indicative of maladjustment and/or loneliness when alone (e.g., sadness, stress). Second, adolescent only children may be less happy in alone time than adolescent children with siblings, but not necessarily lacking in positive affect; they may be content during their alone time, a positive dimension of affect that was not measured. Finally, adolescents with siblings may be happier than adolescents without siblings when spending time alone because alone time is more scarce for them within their households. Adolescents with siblings may appreciate alone time as a form of respite from siblings.

Contrary to the expectations of the resource dilution theory, only children did not respond more positively to time spent with their parents than youths with siblings. Regardless of having siblings or not, all adolescents expressed that time spent with parents was more meaningful compared to time spent alone. Even though only children

spent more time with their parents, they were not happier (or sadder or more stressed) when spending time with parents compared to youths with siblings.

Only children did not have more meaningful interactions with non-household adults in their lives than adolescents with siblings, and expressed mostly similar feelings when they interacted with peers. One exception was for happiness in time spent with peers. Adolescents with siblings were happier when spending time with peers than adolescents without siblings, which may be due to adolescents with siblings being happier with peers because time with siblings socializes them to have more positive interactions with those of a similar age. Additionally, adolescents without siblings may not be unhappy when with peers (as indicated by a lack of differences in negative emotional states with children with siblings in time spent with peers), but rather content with peer time. This study hypothesized that adolescents with siblings might express more positive, and less negative emotions when spending time with peers because of potentially positive sibling socialization that spills over into peer relations. The results supported this hypothesis, showing that only children were less happy when spending time with friends and other peers than youth with siblings. However, only children did not show broad patterns of negative emotions across the three other domains of emotional responses (i.e., decreased meaning, increased sadness, or increased stress) when spending time with non-household youth.

These findings complicate the notion that being an only child is associated with a positive or negative pattern of development. Only children spent more time alone than adolescents with siblings and were less happy in their alone time, but it is not clear if increased time spent alone is associated with positive or negative developmental outcomes for only children specifically and for adolescents more generally. Being accustomed to spending time alone and not experiencing sadness or stress in alone time may be an asset in a labor force that increasingly involves independent and/or contract work and where living alone is increasingly prevalent (Vespa et al. 2013). To the extent that time alone allows for unstructured exploration or play, increased time alone may also be positive for child development (Ginsburg 2007). Then again, alone time could be negative for mental and physical well-being if associated with social isolation. These findings prompt questions about whether links between time alone and increased stress and depressive symptoms found in past research (Hall-Lande et al. 2007) are heterogeneous by sibship size, which deserves further research attention.

Only children miss out on the potentially positive influence of siblings, but avoid the negative role of sibling conflict (Buist et al. 2013), and gain exclusive time with parents. Direct contact with siblings shapes social skills, self

evaluations (Buist and Vermande 2014), and behavior (Solmeyer et al. 2014), often in positive ways, and only children do not engage in sibling socialization. At the same time, only children spend significantly more time with parents. To the extent that these parent-child interactions are more meaningful than time alone, as found in this study, then extra time with parents may positively influence adolescent development for only children (Cripps and Zyromski 2009). Additionally, to the extent that more time alone with parents entails more parental monitoring, then only children may be more protected from negative outcomes such as substance use and delinquency (Barnes et al. 2006). On the other hand, excessive time with parents could be negative if associated with reduced autonomy, especially in the period of increased independence in adolescence. If time with parents is more structured than time in other settings, and unstructured time is more beneficial for development (Ginsburg 2007), then increased time with parents for only children may have negative consequences. Future research should examine the quality of parent-child interactions by sibship size to investigate further how increased time with parents relates to structured versus unstructured activities and developmental patterns among adolescents without siblings.

The American Time Use Survey data allow for substantial progress in understanding social interactions and emotional state disparities between adolescents with and without siblings. Despite the progress made, limitations of this research must be acknowledged. The emotional states measured in the survey do not measure contentment, and the study thus provides an incomplete view of all dimensions of core affect described by Russell (2003). In this study, an absence of happiness did not imply an absence of positive affect, since the data did not allow for an evaluation of both dimensions of positive affect. Future research using other data could include a measure of contentment to better describe how siblings shape positive affect. Birth order is an important factor that explains differences between children with and without siblings in previous research (Falbo 2012), and may also explain the differences between adolescents with and without siblings found in this study. Birth order was not addressed in this study due to limitations of the data, but future work could delineate social interaction patterns and emotional state by birth order to more fully understand the results found in this study. This work evokes questions about the effects of time alone for only children on other domains of adolescent development, and future studies might examine whether being an only child moderates the developmental effects of time alone. These data only allow for measuring disparities in time use and emotional states between those with and without siblings; the study was unable to definitively explain why these patterns occur, and more work is needed to better understand the

driving forces behind the findings. Finally, the associations reported may be moderated by gender, race, ethnicity, and socioeconomic background, and future work should expound on these relationships.

Conclusion

Adolescents with and without siblings may vary in the ways they spend their time. Resource dilution perspectives suggest that adolescents with and without siblings may differ in some companionship patterns and emotional states in alone time and in social interactions, but this topic has not been addressed in the prior literature on only children and sibling effects. This study leveraged the nationally representative American Time Use Survey to examine whether adolescents with and without siblings differed in the proportion of time that they spent alone and in social interactions and their emotional states (happiness, meaning, sadness, stress) during time alone and in companionship. The findings show a trade-off for adolescent only children, whereby they spent more time alone but also more one-on-one time with parents. Future research should delve more deeply into the merits and pitfalls of increased alone and one-on-one time with parents for only children, and also of decreased alone and one-on-one parent time for youth with siblings. Adolescents with siblings may appreciate time away from siblings, given that they expressed more positive feelings when they were alone and also with peers. Future work could also investigate why youth with siblings found time alone and with peers to be happier than adolescent only children. By confirming that adolescents with and without siblings differ in their companionship patterns and in their emotional responses to companions, this study showed the importance of expanding comparisons of only children versus youths with siblings into new domains of development.

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Authors' Contributions JSW participated in the study design and coordination, conducted analysis and participated in drafting the manuscript; EA conceived of the study, participated in its design and participated in drafting the manuscript; ACJ participated in the study design and in drafting the manuscript. All authors read and approved the final manuscript.

Data Sharing and Declaration The manuscripts data will not be deposited. Original data are available online through IPUMS (<https://ipums.org>)

Compliance With Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (IRB Board of Brigham Young University, #A19-201) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained by the United States Bureau of Labor Statistics at the time individuals participated in the study.

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