that order would involve violation of copyright law.
Increased medically assisted reproduction (MAR) use to treat infertility has resulted in a growing twin birth rate. Little is known about parent–child relationships for twin relative to singleton children in middle childhood. This study fills this gap by examining parent–child relationships in 57 families with eighty 6- to 12-year-old MAR twin and singleton children using observational data (warm and supportive communication, control, and hostility). Nested ANCOVAs indicate that while mothers exhibit similar interactional behaviors toward twins and singletons, fathers have less optimum behaviors toward twins relative to singletons. Twins displayed less engaged behavior with mothers and fathers relative to singletons. Given the vitality of parent–child relationships for family and child adjustment, future studies should examine determinants and outcomes of twin–singleton relationship differences to bolster twins’ and their families’ functioning.

Keywords: Twins; Parent–Child Relationships; Medically Assisted Reproduction

In the past 35 years, the twin birth rate has risen from 1% to 3.41% of all births and is projected to continue growing (ASRM, 2012). Despite the increasing number of families raising twins, little is known about parenting twins. Some research shows lower quality parent–twin relationships compared with parent–singleton relationships in early childhood, but there is scarce information about parent–child relationships for twins versus singletons once children reach middle childhood (e.g., past age 5). Twin family research also predominantly focuses on mother–child relationships, despite evidence indicating fathers play important roles in children’s development (Lamb & Lewis, 2013). This study uses observational data comparing parent–child interactions between 6- and 12-year-old...
twins and singletons to provide evidence that attention should be paid to reciprocal parent–child relationships in the growing number of twin families.

**Twins: A Growing Demographic of Families**

The unprecedented twin growth rate has risen due to increased medically assisted reproduction (MAR) use to treat infertility (Chauhan, Scardo, Hayes, Abuhuamad, & Bergella, 2010). MAR covers a range of infertility treatments, including ovulation induction, intrauterine insemination, and assisted reproduction procedures, such as in vitro fertilization (IVF; Zegers-Hochschild et al., 2009). Although twin birth rates vary by procedure, twin births after MAR are more common than in the general population. The general population twin birth rate is 1%, while the MAR twin birth rate ranges from 2% for some types of ovulation induction to 28% for IVF (ASRM, 2012; CDC, 2015; Schieve, Devine, Boyle, Petrini, & Warner, 2009).

In the United States, estimates suggest that more than 250,000 children are born each year after MAR conception (CDC, 2015; Schieve et al., 2009). Current trends, including the increasing age of first pregnancy (Mathews & Hamilton, 2014) and widening insurance coverage for infertility treatments (Martin, Bromer, Sakkas, & Patrizio, 2011), suggest the number of fertility treatment-conceived children will continue to rise. Thus, the number of families raising twins will continue to grow.

As the number of twin births rises, the need to understand systemic characteristics of twin families also increases. In families with singleton children, children typically enter their family one at a time, and parents can often individually address children’s developmental and financial needs while becoming more skilled parents with each successive child. In families with twins, two children enter the family simultaneously and often share developmental tasks with their co-twin. In doing so, evidence suggests twins create a more stressful family environment compared with singleton children (Olivennes, Golombok, Ramogida, Rust, & the Follow-up Team, 2005).

**Parent–Child Relationships in Twin Families**

Parental stress is associated with poorer quality parenting and parent–child interactions (Deater-Deckard, 1998). Given greater parenting stress in twin relative to singleton families (Olivennes et al., 2005), it is not unexpected that twin mothers tend to be less involved, sensitive, and communicative with children (Feldman, Eidelman, & Rotenberg, 2004; Holditch-Davis, Roberts, & Sandelowski, 1999; Thorpe, Rutter, & Greenwood, 2003), provide less-structured home environments (Feldman & Eidelman, 2004), and display more hostility toward children relative to singleton parents (Boivin et al., 2005). Twin mothers also report having less positive interactions with twins (Glazebrook, Sheard, Cox, Oates, & Ndukwe, 2004) and experience parenting as more difficult than singleton parents (Olivennes et al., 2005). Yet, research focuses almost entirely on families with twins younger than age 5 and nearly exclusively on mother–twin relationships. The sole study examining father–twin relationships compared a small sample of fathers of twin and singleton infants and found few differences (Feldman & Eidelman, 2004).

The extant literature suggests early parent–twin relationships may be strained, but very little is known about parent–twin relationships as children reach middle childhood. Examination of parent–twin relationships in middle childhood is essential given that, in response to children’s unique developmental stressors at various ages, parent–child relationships may change over time (Frietag, Belsky, Grossmann, Grossmann, & Scheuermann-Englisch, 1996; Kim, Oesterle, Catalano, & Hawkins, 2015). For example, the transition into school in middle childhood may increase psychosocial difficulties for children (Masten & Coatsworth, 1998; Perry & Weinstein, 1998), which can negatively affect parent–child relationships.
relationships (Mackler et al., 2015; Pardini, Fite, & Burke, 2008). On the other hand, parents have fewer direct caregiving demands in middle childhood due to the transition to school (Blau & Currie, 2006), which could improve parent–child relationships for previously stressed parents. Given changing developmental stressors for children and their parents in middle childhood (Bornstein, 2015; Masten & Coatsworth, 1998), it is vital to examine relational outcomes of twins and their families in this developmental period.

With the exception of behavioral genetics studies that utilize twin designs (O’Connor, Hetherington, Reiss, & Plomin, 1995), to our knowledge, only a handful of studies have examined families with twins in middle childhood. Among the studies of older twins, one suggests mothers of 6- to 12-year-old twins and singletons report similar parent–child relationship satisfaction (Anderson et al., 2014). However, another study notes that mothers of twins may have higher expectations for child conformity to parental rules than mothers of singletons (Anderson, Rueter, Connor, Chen, & Damario, 2015). Notably, the two studies examining middle childhood-aged twins and their families utilize maternal reports of mother–child relationship quality, which can be prone to desirability biases and not accurately reflect the behavior of the dyad (Larsen & Olson, 1990). To improve upon previous research, it is important to examine mother–child relationships once children reach middle childhood while utilizing observational data of mothers and their children.

While relatively little is known about mother–twin relationships in middle childhood, particularly absent is information about father–twin relationships. The lack of information on father–twin relationships is of notable concern as fathers have vital roles in families and unique influences on children’s development (Lamb & Lewis, 2013). For example, fathers may have less engaged interactions with their children compared with mothers (Collins & Russell, 1991; Lamb & Lewis, 2013). Even after accounting for the effects of mother–child relationships, however, father–child relationships play a vital role in children’s academic achievement (Belsky et al., 2008; McBride, Schoppe-Sullivan, & Ho, 2005), psychosocial adjustment (Bogels & Phares, 2008; Murray, Dwyer, Rubin, Knighton-Wisor, & Booth-LaForce, 2014), and peer relationships (Park et al., 2004; Rah & Parke, 2008). Given the importance of father–child relationships for various domains of children’s adjustment, it is essential to examine how fathers may engage with twin relative to singleton children in middle childhood.

Information about twins’ behavior toward their parents is also absent from the current literature, despite evidence indicating children’s behavior influences parenting (Sameroff, 2009). It may be particularly salient to examine differences in twins’ and singletons’ behavior toward their parents given developmental and relational differences between twin and singleton children. For example, twins are often treated similarly and are referred to as a unit instead of as distinct individuals (Bacon, 2006). It has been suggested that this might impact parent–child relationships (Thorpe et al., 2003), including children’s behavior toward their parents (Sameroff, 2009), yet differences in how twins and singletons engage with their parents have not been examined.

**The Present Study**

Despite the growing twin birth rate (ASRM, 2012), virtually all parent–child relationship research is based on families with singleton children. This research and theory notes that several parent–child relationship dimensions, including warmth, supportive communication, parental control, and parent–child conflict or hostility, are important for families and children (Grolnick & Gurland, 2002; Koerner & Fitzpatrick, 2006). Understanding these distinct parent–child relationship dimensions is important because they are related to family and child adjustment (Hill & Bush, 2001; Repetti, Taylor, & Seeman, 2002).
In response to this literature gap and because the rising twin birth rate is due to MAR (ASRM, 2012), this study examines reciprocal parent–child interaction behaviors for MAR twins compared with MAR singletons in middle childhood (6–12 years old). Addressed using observational data of parent–child interactions between mothers, fathers, and their children, the primary research question to be examined in this study is: What are parent–child relationships like in families with MAR twins versus MAR singletons when children are in middle childhood?

**METHODS**

**Participants**

Study families were a subset of participants in the Family Communication Project (FCP; Anderson et al., 2014), a multimethod study designed to assess outcomes of children born after MAR. This study includes intrauterine insemination and assisted reproduction procedures as MAR because these are medically intensive infertility treatments (Zegers-Hochschild et al., 2009). Eligible families had MAR twins or singletons born between 1998 and 2004. Participants were recruited from a metropolitan Midwestern U.S. reproductive medicine clinic after being identified from clinic records. IRB-approved letters introducing the study were sent to eligible patients, asking them to complete a survey. Of eligible families, 86% were located and 82% of located families participated in the larger survey-based study (n = 206 families).

This study included a subset of 57 families with eighty 6- to 12-year-old MAR children (50.0% male; M child age = 8.59, SD = 1.29, n = 50 singletons, n = 30 twins) who participated in the FCP survey and observational components. Among families with singletons, 20% had one child, 52% had two children, and 28% had three or four children. Among families with twins, 67% had two children (e.g., the set of twins) and 33% had three or four children. In addition to survey inclusion criteria, families participating in the observational assessment must have lived (a) in the state of data collection and (b) within 75 miles of the university where the laboratory is located. All families meeting these criteria were invited to participate in the observational assessment. Fifty-one percent of families eligible for the in-lab assessment participated. Comparisons between eligible families that did or did not participate in the observational study indicated participating families had lower incomes (participating: M = 9.53, SE = .28; not participating: M = 10.40, SE = .23; t = −2.39, p = .018) and higher marital satisfaction (participating: M = 6.05, SE = .11; not participating: M = 5.51, SE = .16; t = 2.78, p = .006) than families that did not participate in the observational study. Differences were deemed negligible as means indicate that participating and nonparticipating families have, on average, high incomes and marital satisfaction.

Consistent with national MAR user demographics (Nachtigall, MacDougall, Davis, & Beyene, 2012), most parents (mothers: 95.1%, fathers: 95.9%) were White and had above-average education and incomes. For example, 83.6% of mothers and 65.2% of fathers held a bachelor’s degree or higher. Median family incomes were $90,000–$99,999 (range = 40,000 to more than 200,000). Most families were headed by heterosexual parents (n = 51 families; 89.5%), but five families were headed by same-sex female couples (8.8%), and one family by a single mother by choice (1.7%). Among heterosexual parents, 94.1% were married (n = 48 couples).

**Procedure**

Participating family members (mothers, fathers, and children aged 6–12 years) visited the university research laboratory to complete informed consent/assent prior to the
video-recorded observational assessment. Families received $100 gift cards as remuneration for their time.

Measures

This study compares observed parent–child interaction characteristics for twin and singleton children. Observed parent–child interaction constructs are described below.

Observational protocol

The observational assessment was developed based on focus group and individual interviews with parents of children conceived using MAR. It was designed for salience with families of school-aged MAR-conceived children and to elicit a variety of family interaction behaviors, including warm, supportive communication, control, and hostile behavior. The assessment took place in a room designed to look like a family dining room, with families seated around a dining room table. While all family members were aware they were being recorded, cameras were placed inconspicuously throughout the room. During the task, families were given 15 minutes to discuss 32 statements describing activities or behaviors that may be important to their family. Example statements included, “In our family, it is important to eat meals together” and “In our family, it is important we talk about what happened during the day.” Families were asked to agree on 3–5 statements of most importance and 3–5 statements of least importance to their family. Observational assessments rated the family’s interaction quality.

Observed parent–child interactions

Trained observers used five scales (communication, warmth, listener responsiveness, control, and hostility) from the Iowa Family Interaction Rating Scales (IFIRS; Melby et al., 1998) to globally rate the overall quality of parent–child interactions. The IFIRS has been used in diverse samples and varied structured interaction tasks across the United States with demonstrated concurrent validity and reliability (Melby, 2007; Melby & Conger, 2001). For each scale, observers rated mother’s behavior to each child, father’s behavior to each child, each child’s behavior to the mother, and each child’s behavior to the father. Behavior was globally rated using a 9-point scale (1 = not at all characteristic to 9 = mainly characteristic). For example, a “1” rating on the warmth scale indicated that the family member did not express verbal or nonverbal support, suggesting the person would not be characterized as “warm.” A “9” rating indicated that the person frequently expressed verbal and nonverbal support, suggesting warmth was a primary characteristic of the person.

Before coding videos, observers received training and were required to pass written and observational examinations. Observers attended weekly coder training meetings to prevent coder drift during coding. To estimate inter-observer reliability, 49.1% of the videos (n = 28 families) were randomly assigned for assessment by a second observer. Inter-observer reliability was tested using weighted intraclass correlations (Cicchetti, 1976; Shrout & Fleiss, 1979).

Warm, supportive communication was assessed using three scales from the IFIRS: communication, warmth, and listener responsiveness. The communication scale examines the extent to which each family member conveys his/her needs and expresses information that may be perceived as useful by other family members. Family members with high communication scores explain their point of view, use logical reasoning to further conversations, solicit other points of view, and encourage others to participate in the discussion (communication ICCs: mom to child: .75; dad to child: .75; child to mom: .60; child to dad: .62). The warmth scale measures the extent to which each family member expresses praise, care, or
support for other family members. This scale assesses nonverbal (e.g., affectionate touching), supportive (e.g., offering encouragement) behaviors, and the content of statements that express empathy or liking. Higher scores on the warmth scale indicate more supportive, warm behavior (warmth ICCs: mom to child: .76; dad to child: .86; child to mom: .87; child to dad: .91). The listener responsiveness scale assesses the extent to which each family member listens and acknowledges when another family member is speaking. Listening behaviors can be nonverbal behaviors (e.g., leaning toward speaker) and verbal assents (e.g., “mmhmm”); behaviors convey that the listener is interested in what other family members have to say and validate or reinforce other family members as they are speaking. Higher scores indicate more listening behaviors (listener responsiveness ICCs: mom to child: .76; dad to child: .70; child to mom: .45; child to dad: .54).

The control scale examines the degree to which each family member attempts to influence or dominate the conversation or the behavior of other family members, and how often they are successful in these attempts. Higher scores indicate the family member attempts to and influences other family members in conforming to their opinions, beliefs, or desired behaviors (control ICCs: mom to child: .89; dad to child: .80; child to mom: .58; child to dad: .77).

The hostility scale measures the extent to which a family member displays angry, critical, or disapproving behavior toward another family member’s behavior or appearance. The hostility scale captures nonverbal behavior (e.g., body posture), emotional expressions (e.g., negative or raised tones of voice), and discussion content (e.g., critical comments that blame or ridicule other family members). Higher scores reflect more critical or hostile behavior (hostility ICCs: mom to child: .80; dad to child: .55; child to mom: .79; child to dad: .72).

**Covariates**

Evidence drawn from previous research led to the inclusion of child sex (1 = female, 2 = male; Starrels, 1994) and parents’ education levels (1 = did not complete high school to 7 = doctoral degree; Conger & Donnellan, 2007) as possible covariates in analyses.

**Data Analysis Plan**

**Missing data**

Study variables had fewer than 5% missing data. T-test and chi-square comparisons between participants with complete data on all variables and those missing data on any variable showed no differences in twin status or demographic data, and just two differences on observed family interactions (mom hostility to child: missing data: \( M = 1.17, SE = .08 \), no missing data: \( M = 1.66, SE = .12, t = 3.28, p < .01 \); child hostility to mom: missing data: \( M = 1.26, SE = .11 \), no missing data: \( M = 2.02, SE = .22, t = 3.08, p < .01 \)). Examination of the two differences on the observed interactions indicates that the data were missing at random (Acock, 2005; Schafer & Graham, 2002). When data are missing at random—as in this study—algorithm-based missing data recovery approaches are widely preferred to traditional missing data methods (e.g., list-wise deletion; Enders, 2010; Johnson & Young, 2011). Thus, missing data were imputed using study and demographic data with the expectation maximization function in SPSS 22.0 (Armonk, NY).

**Analysis plan**

Study research questions called for comparing observed interaction levels across twins and singletons, while controlling for potential covariates. To accomplish this, four sets of five analyses of covariance tests (ANCOVAs) were performed. The first set tested differences in mothers’ interactions toward a twin versus a singleton child for each of the
interaction constructs (communication, warmth, listener responsiveness, control, and hostility). The remaining ANCOVA sets tested differences in (set 2) fathers’ interactions toward twins versus singletons, (set 3) twins’ versus singletons’ interactions toward mothers, and (set 4) twins’ versus singletons’ interactions toward fathers. Initial analyses adjusted for child sex and the parent’s own education (e.g., maternal education was used when examining reciprocal mother–child interactions). In the final model for each parent–child interaction outcome, covariates that were not associated with the parent–child interaction variable were removed.

Analyses utilized an individual-level dataset with multiple children in the same family (n = 80 children from 57 families), suggesting the presence of shared variance (Cook, 2012). To account for the inflated F-values that occur due to shared variance, analyses were run with the SPSS MIXED MODELS function. MIXED MODELS runs ANCOVAs using a general linear modeling framework that can be used to account for the shared variance that occurs when children are nested in families. To use this function, first, every family was assigned a family identification number and each child within the family was assigned a child identification number. To construct each ANCOVA, data were grouped by family (e.g., the family identification number was entered as “subjects” in SPSS), while the individual children within each family were allowed to have correlated errors (e.g., the child identification number was entered as “repeated” in SPSS).

RESULTS

Preliminary Analyses

Potential twin–singleton differences on demographic variables were examined prior to addressing research questions. As shown in Table 1, twin mothers were significantly younger than singleton mothers, F(1, 42) = 11.14, b = −2.71, p = .002, but there were no differences in fathers’ age across groups. Twins (43.3%) were more likely than singletons (14.0%) to be born prematurely, χ² = 8.60, p = .003, and there were no differences in child sex across twins and singletons. To ensure that differences in parent–child interaction characteristics were not due to spurious demographic effects, the relationship between parent’s age and child prematurity status with parent–child interaction characteristics was tested. These variables were not related to parent–child interactions, and therefore, they were not included in final analyses.

Parents’ Interaction Characteristics: Twins versus Singletons

Table 2 presents differences between twins and singletons on parent–child interaction characteristics. Notable main effects, as well as significant covariate effects, are reported below.

Mothers’ interactions toward twins and singletons

Overall, mothers displayed few interaction behavior differences between twins and singletons. One exception is that mothers were less likely to exhibit hostile or irritable behaviors toward twin relative to singleton children, F(1, 21) = 160.47, b = −.90, p < .001. Tested covariates were largely not related to the quality of mothers’ interactions toward children; nonsignificant covariates were not retained. An exception was that higher maternal education was related to more supportive communication behaviors directed from mothers to their children, F(1, 116) = 15.32, b = .71, p < .001.
TABLE 1
Demographic Differences Between MAR Twins and MAR Singletons and Their Families

<table>
<thead>
<tr>
<th></th>
<th>Singletons (n = 50)</th>
<th>Twins (n = 30)</th>
<th>F</th>
<th>b</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SE</td>
<td>M</td>
<td>SE</td>
</tr>
<tr>
<td>Mother age</td>
<td>43.89</td>
<td>.50</td>
<td>41.18</td>
<td>.64</td>
</tr>
<tr>
<td>Father age</td>
<td>44.35</td>
<td>.71</td>
<td>44.09</td>
<td>1.02</td>
</tr>
<tr>
<td>Child age</td>
<td>8.79</td>
<td>.19</td>
<td>8.18</td>
<td>.27</td>
</tr>
<tr>
<td>Mother education</td>
<td>5.23</td>
<td>.12</td>
<td>5.01</td>
<td>.16</td>
</tr>
<tr>
<td>Father education</td>
<td>4.80</td>
<td>.14</td>
<td>5.21</td>
<td>.19</td>
</tr>
<tr>
<td>Family income</td>
<td>9.40</td>
<td>.30</td>
<td>9.84</td>
<td>.43</td>
</tr>
</tbody>
</table>

Notes. All means and standard errors reported for singletons and twins reflect marginal means after adjusting for shared family variance. Singletons were the reference category in all the analyses.

Mother and father education were measured on a 7-point scale (1 = did not complete high school, 2 = high school diploma, 3 = some college, 4 = associate's degree, 5 = bachelor's degree, 6 = master's or professional degree, 7 = doctorate). Family income was measured on a 13-point scale (1 ≤ $10,000, 2 = $10,000–19,999, 3 = $20,000–29,999, 4 = $30,000–39,999, 5 = $40,000–49,999, 6 = $50,000–59,999, 7 = $60,000–69,999, 8 = $70,000–79,999, 9 = $80,000–89,999, 10 = $90,000–99,999, 11 = $100,000–149,999, 12 = $150,000–199,999, 13 ≥ $200,000).

**p < .01.

TABLE 2
Differences in Parent–Child Interaction Characteristics Between MAR Twins and MAR Singletons

<table>
<thead>
<tr>
<th></th>
<th>Singletons (n = 50)</th>
<th>Twins (n = 30)</th>
<th>F</th>
<th>b</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SE</td>
<td>M</td>
<td>SE</td>
<td></td>
</tr>
<tr>
<td>Mothers' interaction to child</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>5.50</td>
<td>.21</td>
<td>4.94</td>
<td>.29</td>
<td>2.39</td>
</tr>
<tr>
<td>Warmth</td>
<td>4.07</td>
<td>.20</td>
<td>4.00</td>
<td>.07</td>
<td>0.79</td>
</tr>
<tr>
<td>Listener responsiveness</td>
<td>4.91</td>
<td>.25</td>
<td>4.40</td>
<td>.40</td>
<td>1.24</td>
</tr>
<tr>
<td>Control</td>
<td>5.34</td>
<td>.24</td>
<td>5.84</td>
<td>.46</td>
<td>0.95</td>
</tr>
<tr>
<td>Hostility</td>
<td>1.92</td>
<td>.05</td>
<td>1.02</td>
<td>.06</td>
<td>160.47***</td>
</tr>
<tr>
<td>Fathers' interaction to child</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>4.55</td>
<td>.14</td>
<td>3.71</td>
<td>.39</td>
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</tr>
<tr>
<td>Warmth</td>
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<td>.24</td>
<td>2.76</td>
<td>.41</td>
<td>1.71</td>
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<tr>
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<td>4.48</td>
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<td>3.42</td>
<td>.37</td>
<td>6.73**</td>
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<tr>
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<td>5.66</td>
<td>.17</td>
<td>3.96*</td>
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<tr>
<td>Hostility</td>
<td>1.25</td>
<td>.06</td>
<td>1.79</td>
<td>.16</td>
<td>10.38***</td>
</tr>
<tr>
<td>Child's interaction to mother</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
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<td>.17</td>
<td>2.83</td>
<td>.27</td>
<td>4.50*</td>
</tr>
<tr>
<td>Warmth</td>
<td>2.93</td>
<td>.13</td>
<td>2.57</td>
<td>.27</td>
<td>1.53</td>
</tr>
<tr>
<td>Listener responsiveness</td>
<td>3.25</td>
<td>.16</td>
<td>3.40</td>
<td>.25</td>
<td>0.28</td>
</tr>
<tr>
<td>Control</td>
<td>4.20</td>
<td>.16</td>
<td>3.53</td>
<td>.33</td>
<td>3.34*</td>
</tr>
<tr>
<td>Hostility</td>
<td>1.76</td>
<td>.18</td>
<td>1.22</td>
<td>.13</td>
<td>6.60*</td>
</tr>
<tr>
<td>Child's interaction to father</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Communication</td>
<td>3.26</td>
<td>.21</td>
<td>2.46</td>
<td>.28</td>
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</tr>
<tr>
<td>Warmth</td>
<td>2.93</td>
<td>.25</td>
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<td>.16</td>
<td>1.36</td>
<td>.14</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Note. Singleton children were the reference category in all the analyses.

*p ≤ .075, *p < .05, **p ≤ .01, ***p ≤ .001.
Fathers’ interactions toward twins and singletons

On several measures, fathers showed differences in interactions toward twin relative to singleton children. For example, fathers were less likely to engage in supportive communication with twins, \( F(1, 49) = 4.33, b = -.84, p = .043 \), or listen well to twin children, \( F(1, 31) = 6.73, b = -1.06, p = .014 \), relative to fathers of singletons. Fathers also exhibited greater controlling behaviors, \( F(1, 111) = 3.96, b = .53, p = .049 \), as well as more hostile or irritable behavior toward twin relative to singleton children, \( F(1, 10) = 10.38, b = .54, p = .009 \). Tested covariates were largely not associated with the quality of fathers’ interactions toward children; nonsignificant covariates were removed from final models. Among model covariates, fathers engaged in fewer positive communication behaviors, \( F(1, 61) = 16.62, b = -1.12, p < .001 \), but also exhibited less hostility, \( F(1, 47) = 15.51, b = -.49, p < .001 \), with female children compared with male children.

Twins’ and Singletons’ Interaction Characteristics toward Parents

Twins’ and singletons’ interaction toward mothers

Several twin and singleton interaction differences emerged when examining children’s behavior toward mothers. For example, twins were less likely to engage with mothers using supportive communication behaviors, \( F(1, 54) = 4.50, b = -.67, p = .039 \), and twins were less hostile toward their mothers relative to singleton children, \( F(1, 10) = 6.60, b = -.54, p = .027 \). Tested covariates were not associated with the quality of the children’s interaction with their mothers; all covariates were removed from the final models.

Twins’ and singletons’ interaction toward fathers

Several differences in twin and singleton behavior toward fathers were also found. Twins engaged their fathers in less supportive communication behavior relative to singletons, \( F(1, 61) = 5.09, b = -.80, p = .028 \). Twins also exhibited fewer controlling attempts over their fathers relative to singleton children, \( F(1, 45) = 6.44, b = -.88, p = .015 \). Tested covariates were largely not associated with the quality of the children’s interaction toward fathers; nonsignificant covariates were removed from final models. Higher levels of paternal education were associated with an increase in positive communication behaviors, \( F(1, 9) = 4.90, b = .31, p = .053 \), but also more controlling behaviors, \( F(1, 48) = 20.01, b = .70, p < .001 \), directed from children to their fathers.

Post hoc analyses

Post hoc paired samples \( t \) tests were conducted using the twin sample to examine potential differences in mothers’ and fathers’ interactions with their twins. Mothers were more likely than fathers to engage in supportive communication with twins, \( t = 2.62, p = .014 \), and listen well to twin children, \( t = 2.70, p = .012 \). There were no differences between mothers’ and fathers’ behavior toward twins for the other interaction characteristics. There were no differences between twins’ interaction quality toward mothers and fathers.

DISCUSSION

Despite studies indicating twins have less optimum mother–twin relationships in early childhood (Olivennes et al., 2005), this study indicates mothers’ interactions with 6- to 12-year-old twins and singletons are relatively similar. Results suggest that there is reason to be concerned about fathers’ interactions with twins and twins’ engagement in their relationships with both parents. Thus, there is reason to monitor the growing number of twins.
and their families past early childhood given largely unique, less optimum parent–child relationships in middle childhood.

**Father–Twin Relationships: Explanatory Factors for Future Research**

Our findings that fathers exhibited less optimum relationship behaviors, such as less positive communication and listening as well as more controlling and hostile behavior, toward twins compared with singletons is concerning. This is because research on father engagement, which includes warmth and control parent–child relationship dimensions, indicates father–child relationship quality in middle childhood impacts children’s functioning through adulthood (Flouri & Buchanan, 2002; Koestner, Franz, & Weinberger, 1990). Fathers also affect children’s psychosocial adjustment, academic success, and peer relationships (Lamb & Lewis, 2013).

Given limited information on twin fathers, evidence from nontwin populations may provide explanations for why fathers in this study demonstrated less optimum relationship behaviors to twins relative to singletons. One explanation may lie in fathers’ desired versus actual level of involvement with the day-to-day tasks of raising twins. Extant literature suggests when fathers demonstrate a desire and engage in early care for their children, positive father–child relationships develop; when fathers provide care for their children exceeding their desired amount of care, early father involvement may have negative effects on father–child relationships (Cabrera, Tamis-LeMonda, Bradley, Hofferth, & Lamb, 2000). It is possible fathers’ early care of twins exceeds their level of desired care, resulting in the less optimum father–twin interactions found in this study. Indeed, mothers of young multiple-birth children report some fathers have disengaged from family relationships due to the strain twins place on their families (Ellison & Hall, 2003). Twin fathers might also spend less time with their children and be less equipped to deal with the demands of raising middle childhood-aged twins. Maternal reports corroborate this possibility; some multiple-birth mothers perceive the children’s father to be overwhelmed by childcare demands (Ellison & Hall, 2003). Mothers’ perceptions about fathers’ inability to provide quality care for their children may result in maternal gatekeeping, which can also prevent fathers from developing relationships with their children (e.g., Meteyer & Perry-Jenkins, 2010). Future research should test these explanations so as to identify risk and protective factors for father–twin relationships that can be used to bolster twins and their families’ functioning.

**Twin–Parent Relationships: A Fruitful Area for Future Research**

Limited prior examination of twin behavior toward parents leaves few solid explanations for our findings that twins tend to be less engaged with their parents than singletons. Mothers of twins may address twins as a unit and spend less individual time with twins than singletons and their siblings (Thorpe et al., 2003). Doing so may be associated with twins becoming closer to one another (Fraley & Tancredy, 2012), possibly at the expense of the parent–child relationship. This explanation remains speculative until the effects of twin sibling relationships on parent–child relationships are more fully studied through future research. Unfortunately, our data do not allow for clear consideration of twin versus singleton sibling sibling relationship differences because of the variable number of children within the family (see Participants section).

Exploring sibling relationship effects on parent–child dyads for twins compared with singletons may have important implications for twin family dynamics. This is because twins may have unique relationships with their co-twin (Fraley & Tancredy, 2012) and sibling relationships influence parent–child relationships (Kim, McHale, Osgood, & Crou-ter, 2007). Moreover, sibling (Samek & Rueter, 2011) and parent–child (Hill & Bush, 2001;
Repetti et al., 2002; Sameroff, 2009) relationships have implications for family functioning and child adjustment. Exploring the determinants and outcomes of twins’ differential behavior toward parents relative to singletons may yield vital information on twins and their families’ functioning.

**Generalizing Findings to Twins Conceived without Fertility Treatments**

Findings from this study with MAR twins may generalize to twins conceived without fertility treatments, but differences between families with MAR and non-MAR children should be considered when attempting this generalization. Parents who conceive children after MAR may have diminished social support and parenting efficacy compared with parents who did not use fertility treatments to conceive children (Hammarberg, Fisher, & Wynter, 2008; Munro, Ironside, & Smith, 1992); these constructs are related to poorer parent–child relationship quality (Belsky, 1984). Families that use MAR to conceive children are often more aware of twin risks, and in some MAR treatments such as IVF, parents can make treatment decisions to increase the probability of twins due to a desire for twin births (Sharara, 2013). During such treatments, fathers are less likely than mothers to want twins and often wish to implant fewer embryos to avoid multiple births (Hojaarda, Ottosen, Kesmodel, & Ingerslev, 2007). The desire for twins and ability to increase this possibility is arguably not the case for families with twins conceived without fertility treatments, and decision-making about fertility has later parent–child relationship and child adjustment implications (Santelli et al., 2003). The aforementioned differences between MAR and non-MAR families should be considered when generalizing results to twin families where children were conceived without fertility treatments.

**Study Strengths and Limitations**

Several strengths bolster confidence in our findings. Chief among study strengths is the use of observational data to assess reciprocal parent–child relationships because observational data reduce biases associated with self-reported data (Larsen & Olson, 1990). This may be particularly true in families with MAR children, because MAR children are highly desired and often described by parents as special (Hjelmstedt, Widstrom, Wramsby, & Collins, 2004). This study expands upon previous literature limitations by including interactions between mothers, fathers, and children. In some cases, multiple children in the same family were included in the study. When unaccounted for, shared family variance can result in biased inference estimates (Cook, 2012); we utilized analytical methods to account for shared variance in this study.

Limitations should also be considered. Data were drawn from one reproductive medicine clinic. While there was a high clinic recruitment rate for the FCP self-report portion (82%), 51% of eligible participants completed the observational assessment. Yet, participants reflect the population of MAR users in the United States: highly educated, high-income White families (Nachtigall et al., 2012). Comparisons between eligible FCP families that participated and did not participate in the observational assessment yielded few differences in self-reported demographic data, family dynamics, and child adjustment (see Participants section). Our investigation of the data suggests study families are similar to the population of U.S. families with MAR twins and singletons.

Other characteristics of the sample used in this study should be noted as potential limitations and directions for future research. In the dataset used in this study, the twin pregnancy rate was consistent with national post-MAR twin rates (CDC, 2015; Schieve et al., 2009). While reflective of the broader population of interest, this creates a study with an unequal distribution of families with twins and singletons. It is also important to note that, in an effort to maintain validity to the broader population of MAR families, the
sample included a range of family sizes (e.g., one to four children in the family). Given concerns about multicollinearity, the number of children in the family was not used as a covariate. Future research should replicate the findings of this study using a study design that accounts for the variability in family sizes.

Finally, possible limitations in the measurement and analysis of the study data should be discussed. In this study, all of the observed parent–child interaction scales had acceptable intraclass correlations (e.g., values above .40; Cicchetti & Sparrow, 1981; Cicchetti et al., 2006). While there was good or excellent reliability for the majority of the parent–child interaction scales, several observed scales had only “fair” reliability between coders (e.g., ICCs between .40 and .59; Cicchetti & Sparrow, 1981). Scales with lower reliability may have increased measurement error, and thus a greater likelihood of Type II error in hypothesis testing (Hallgren, 2012). Among scales with fair reliability (listener responsiveness child to mom and dad, control child to mom, and hostility dad to child; see Observed Parent-Child Interaction subsection), results may represent conservative findings about differences between parent–child interactions in MAR twin and singleton families.

It is also vital to note that multiple statistical tests were used in this study. While it may be argued that an alpha correction strategy could be applied to analyses to reduce the likelihood of Type I error, this approach was not taken for two primary reasons. First, this study is best described as exploratory given limited research on parent–child interactions in twin families. Alpha correction strategies increase the likelihood of Type II error (Perneger, 1998), which may be especially detrimental in exploratory studies that are seeking to identify potentially important differences between study groups that may exist in the population. Second, correction strategies are most appropriate when studies have one grand hypothesis. Given the distinct nature of study parent–child interaction characteristics, as well as the study’s exploratory nature, alpha correction strategies would not be appropriate for use in the present analyses (Perneger, 1998). Future research should utilize larger samples that account for Type I error concerns to confirm results.

CONCLUSIONS

This study suggests differences in parent–child relationships between twins and singletons and their parents may continue into middle childhood. It is the first study to examine observed, systemic relationships between mothers, fathers, and children for twin versus singleton families in middle childhood. In doing so, the results show that fathers tend to exhibit less optimum relationship behaviors toward twins, and twins appear to be less engaged in relationships with mothers and fathers relative to singletons. Given the importance of parent–child relationships for family functioning and child adjustment, future research should examine determinants and outcomes of relational differences between twins and singletons and their families.

REFERENCES


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