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ORIGINAL PAPER

Quality and Quantity: A Study of Father–Toddler Rough-and-Tumble Play

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Abstract

Parent–child interactions are critical for a child's overall wellbeing and growth, however there are differences in the types of interactions that mothers and fathers engage in. For example, fathers often utilize physical play, such as Rough-and-Tumble Play (RTP), to interact and bond with their child. Father-child RTP appears to contribute to a range of child outcomes, including social, emotional cognitive and behaviour development. Given the now robust evidence for these benefits of father–child play and RTP specifically, there is a need for a more complete understanding of the factors that contribute to the quality of fathers' RTP. This study examined the association between quality of father–toddler RTP and a range of paternal characteristics, parenting factors, child demographics and child developmental domains. The study included 64 sets of parents (mothers and fathers) and their toddler (age 18–24 months). Parent-reported questionnaires (demographic information, frequency of father–toddler RTP, father parenting stress, and child social-emotional development) were collected, observations of child developmental attainment (Bayley-III) completed and father–toddler RTP play interactions were rated for quality. We found that RTP for fathers who engaged in more father–toddler RTP, whose children were older and more socially-emotionally mature, was rated as higher quality in their RTP. By demonstrating links of RTP quality with both parenting behaviour and child development, this study contributes to a more complete understanding of the nature and context of father–child interactions. Father–child physical play, including RTP, may present an opportunity for professionals to bring fathers into their work with families.

Keywords Fathering · Father–child relations · Rough-and-tumble play · Physical play · Play quality

Highlights

- When fathers engage in physical play with their children, it is generally more stimulating, vigorous and arousing for the child than mothers' play.
- The frequency of rough and tumble play is closely related to the quality of the play
- The quality of rough and tumble play is linked to children's age and social-emotional maturity.

Interactions between parents and children are characterised by complex patterns of behaviours, feelings, and expectations of both parent and child (Anthony et al., 2005). When parents engage in positive interactions with their children, distinguished by warm and caring behaviours, children are less likely to display disruptive or externalising behaviours (Kerr et al., 2004). Similarly, parents who give emotional support (e.g., empathy) and cohesiveness (e.g., matching body language) during parent–child interactions have children with stronger social skills and capacity (Haven et al., 2014). The way parents interact with their children depends on context and needs, and ranges from functional caregiving (such as feeding and bathing), to playful games and physical activities (Roggman et al., 2000).

Physical play between parent and child can be vigorous and may involve bursts of high energy with frequent body contact (Grossmann et al., 2002; St George & Freeman, 2017). Throwing and catching, dancing, and swinging paired with exhilarating emotions such as surprise, humour and

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fright are common in this type of play (Grossmann et al., 2002; Hazen et al., 2010). Although both mothers and fathers engage in physical play with their child (Ramchandani et al., 2013), research suggests that fathers do it more frequently (Dickson et al., 1997; Freedson & Evenson, 1991). Fathers' physical play is also described as more stimulating, vigorous and arousing for the child, with mothers' physical play described as calmer, focussing more on pretend play and language (Meuwissen & Carlson, 2015; Tamis-LeMonda, 2004). Both biological and cultural factors are likely to account for differences in intensity and frequency of physical play. For example, Kuo et al. (2018) proposed that higher levels of testosterone in fathers promote physical play, and testosterone levels in utero are believed to influence gendered play styles (Xiong & Scott, 2020). Cultural norms can also modulate the intensity and frequency of physical play: mothers are often perceived as the 'nurturer', providing the child's immediate care needs (e.g., feeding, bathing), whereas fathers are more likely to be considered 'playmates' (John et al., 2013; Lamb & Lewis, 2013).

Physical play between father and child consists of playful, body contact interactions such as chasing, swinging, catching, spinning, hugging, and tickling (St George & Freeman, 2017), while rough and tumble play (RTP), as a subset of physical play, incorporates the physical interaction elements of competition and cooperation (e.g., letting the child win often but lose sometimes), dominance and dominance swapping (e.g., being in control, but also periodically swapping roles so that the child dominates the play), playfulness, and positive emotion (e.g., laughter and joy; Flanders et al., 2013; Fletcher et al., 2013). Whilst RTP can be confused with genuine aggression, these physical interactions arise from different motivational systems. RTP is associated with a desire to bond and affiliate with others, whereas aggression is associated with a motivational system to survive (Jones, 1972; Pellis et al., 2018).

It is now understood that high quality father-child RTP is linked with positive child behaviours including a lower risk of externalizing behaviours. For instance, Flanders and colleagues (2009; 2010), reported that children whose fathers engaged in lower quality RTP, characterised as fathers being less dominant in play, were more likely to experience adverse developmental outcomes. Similarly, higher quality father–child RTP has been associated with a broad range of positive aspects of children's overall development and wellbeing, including social competence (Barth & Parke, 1993; MacDonald & Parke, 1984), emotion regulation (Flanders et al., 2010), self-regulation (Anderson et al., 2019; StGeorge et al., 2015), and lower aggression (Anderson et al., 2019); (see St George & Freeman, 2017 for a review).

Given the now robust evidence for the benefit of father–child play (Amodia-Bidakowska et al., 2020) and RTP specifically (St George & Freeman, 2017), there is a need for a more complete understanding of the factors that contribute to the quality of RTP (Flanders et al. 2009; Roggman et al., 2002). As play is a reciprocal activity, the quality of the play is likely to be influenced by both the father and the child. Previous research on father–child physical play and RTP has highlighted only a few influential paternal characteristics. One is a link between the frequency and quality of the play itself. Fathers who more frequently engage in RTP are more likely to do it well, as measured by their child's sustained motivation to play (Paquette et al., 2003), under the assumption that if the play was not enjoyable, then the child would not participate. Similarly, fathers who are less likely to engage in regular RTP and/or physical contact with their child, tend to enact poorer quality RTP, as characterised by less dominance during play (Flanders et al., 2009). Fathers' age is a further characteristic that may influence RTP frequency and quality. Fathers tend to be more involved in RTP when they are younger, under 29 years, and then again when older, over 45 years (Paquette et al., 2003). Regarding education and income however, there are mixed findings regarding the frequency and quality of RTP: some studies report no differences (Anderson et al., 2019; Carone et al., 2020), while others show some fathers on high incomes play RTP less frequently (Paquette et al., 2003). This is an indication that fathers' work hours may impinge on the frequency of RTP, and by extension on its quality.

Following this line, the number of hours that a father has with his child may plausibly be linked to the frequency or quality of his RTP. When fathers are more often at home with the child, there may be more opportunity for physical, boisterous play. However, early studies on fathers' play by Lamb and colleagues suggested that, as a proportion of their available time, even when limited, fathers spend more time playing than mothers. This evidence helped to discount the 'availability hypothesis' regarding infant–father attachment (Lamb, 1975), that is, that infants only form attachments with those most available. However, measures of direct involvement with children are generally not taken in studies of RTP, and there have been few studies of RTP quality with stay-at-home fathers. Thus, employment status and possibly income stand as proxies for father involvement. Overall though, the evidence of patterns of father involvement in RTP in part complement father involvement in other types of interactions with children, where fathers who are older, higher educated, who spend less time at work, have less intense occupational demands, and have higher incomes are more likely to engage in higher quality interactive playing, reading, or outings with their children (Cooney et al., 1993; Yeung et al., 2001).

A further important factor that may influence the frequency and quality of fathers' RTP is paternal mental

health. There is robust evidence that fathers' mental health is associated with child development (Fisher, 2017; Huang et al., 2014), the mechanism for outcomes being parenting interactions (Psychogiou et al., 2020). Distress fosters harsher parenting styles and negative perceptions about interactions, and insecure attachment for the child (Lee et al., 2018; Swain et al., 2014). With infants, when fathers are depressed, their play style is less physically playful and stimulating (Sethna et al., 2018), and Carone et al. (2020) found high stress in fathers of young children (3–10 years) was associated with lower quality RTP. Although some researchers measure stress or anxiety and RTP in the one study, the association with RTP quality is not measured (e.g., Fliek et al., 2015). There is some evidence to suggest that fathers' stress can be mediated by the quality of their father–child play, whereby interactive play has a healing effect for fathers (Roy & Lucas, 2006). However, given the known association between paternal parenting stress and child factors (McBride et al., 2002), it is important to have more direct evidence of the association between parenting stress and father–child RTP.

Concerning the influence of child factors on father–child physical play and RTP, most studies of RTP focus on children aged between 24–72 months old (St George & Freeman, 2017). Whilst the frequency of RTP tends to peak at around age 3–4 years (MacDonald & Parke, 1986), child age does not seem to be significantly associated with the quality of RTP (Anderson et al., 2019); however, child age can influence the type of RTP fathers engage in. Often labelled RTP, 'rough play' with infants, such as bouncing, lifting, or moving their body through space does not have the chasing, playfight or competitive elements. With more mature motor, social-emotional and cognitive skills, children can engage in more complex and vigorous physical play, encompassing the competitive, make-believe elements of RTP (Kochanska et al., 2000; Rothbart et al., 2003). Despite children developing skills important for RTP (i.e., tumbling, wrestling and sharing) well before 48 months of age, there are no known studies of RTP in the early toddler period (18–24 months) following infancy. This would be important to understand as physically boisterous interactive play is likely to be influenced by, or influential on, developmental domains such as motor skills and social-emotional competencies. High quality father RTP with toddlers may support development of a later, more mature RTP and or contribute to key domains of child development, as seen in the few longitudinal studies of RTP (Anderson et al., 2019; Flanders et al., 2010).

Child sex is an important feature that has implications for the frequency and outcomes of father–child RTP. Some studies report that fathers engage in RTP more frequently with boys than girls (Paquette et al., 2003), while others find that there are no sex differences in the frequency of father–child RTP (Paquette & Dumont, 2013; Shears, 2007). Additionally, there are suggestions that sex can alter the type of RTP a father engages in, with father–daughter RTP play behaviours more often mimicking behaviours related to caring, protecting, and rescuing, and involving more language, compared to father–son RTP, which involves greater levels of fighting and play strength competition (Harbin, 2016; Jarvis, 2006), with these interactions more commonly referencing current media (e.g., television, movies, and video games, Erden & Alpaslan, 2017; Pellegrini et al., 2007). Further, father–son RTP has been found to include greater levels of activity, intensity and competition compared to father–daughter RTP (Fry, 2005; Shaffer & Kipp, 2013). Given the interconnectedness of research on the biological, neurological and socio-cultural bases of sex and masculinity, it is important to include this variable in studies of RTP (Friedman & Downey, 2014). Other key variables to include (or control for) in studies of parent–child interactions include birth order and attendance at day-care (child-care), since interactions with peers and siblings are variables known to be linked to child development, especially social-emotional skills (Felfe & Lalive, 2018; Tucker et al., 2009).

In sum, there are a range of fathers' personal characteristics, parenting factors, child demographics and child developmental domains that are linked to RTP between fathers and children (see Fig. 1). In order to gain a more complete understanding of RTP, the aim of this study is to examine father and child characteristics that may be associated with the quality of father–child RTP in children aged 18–24 months (toddlers). Our objectives were to examine the strength and direction of association of the quality of RTP with fathers' personal characteristics (age, education, employment, workhours, income), fathers' parenting factors (caregiving responsibility, parenting stress and RTP frequency), child characteristics (sex, age, birth order, and day-care attendance) and child developmental domains (cognition, language, motor, and social-emotional).

Based on the literature with older children (preschool-middle childhood), it is expected that fathers who engage more frequently in RTP with their toddlers, who are older, with higher education and income, will participate in higher quality of RTP interactions with their toddlers. We expect that father availability (work hours or caregiving responsibility) will not be associated with quality or frequency. In contrast, we expect that paternal stress will be associated with poorer father–toddler RTP quality. Finally, we expect that RTP quality will be higher for father–child dyads where the child is older, male and developmentally more mature in the domains of cognition, language, motor and social-emotional skills.

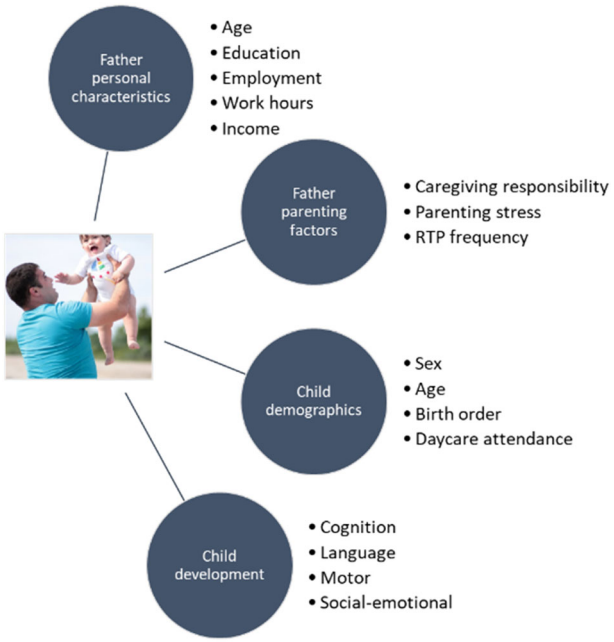

Fig. 1 Conceptual model of influences on the quality of RTP

Method

Participants

The study included 71 families (father, mother and toddler). Families were eligible to participate if the toddler was aged between 18 and 24 months old, as this period corresponds with a time when father–child RTP is observable in play interactions (Pellegrini & Smith, 1998). Further, the toddler was required to share a common home with both biological parents so as to reduce the heterogeneity of the sample in terms of possible confounding factors (Reijntjes et al., 2010). Exclusion criteria included known child developmental delay, or an inability of the father or toddler to engage in physical activities such as running and jumping as this would confound the quality of parent–child RTP. Father–toddler dyads were excluded from the analysis if they discontinued the study ($N = 2$); if their 'rough-and-tumble' play segment could not be coded (i.e., if the toddler or father refused to engage in RTP; $N = 4$); or questionnaires were incomplete and the missing data was beyond the limit for correction ($N = 1$). The final sample for analysis consisted of 64 fathers aged between 24 and 49 years old, who were either married (81%) or de facto (19%; Table 1). Fathers were generally well educated, with 58% of fathers reporting that they had completed tertiary education and an additional 19% indicating that they had completed post-school vocational training qualifications. A high proportion of fathers were employed (94%), working an average of 36 ($SD = 9.89$) hours per week with more than half earning an annual income over AUD $100,000. Twenty-nine male and 35 female toddlers between the age of 18 and 24 months ($M = 20.05$, $SD = 3.19$) participated. Over three quarters of toddlers were first-born (76.6%), with half the sample identified as Caucasian or Australian (52%) and most attended child-care (65%; see Table 2).

Table 1 Parents' personal characteristics ($N = 64$)

Parents' personal characteristics	Fathers *n* (%)	Mothers *n* (%)
Age in years (mean [SD])	34.2 (4.93)	32.72 (4.47)
Marital Status[a]		
Married	52 (81.3)	52 (81.3)
Defacto	12 (18.8)	12 (18.8)
Educational attainment[c]		
Year 10	1 (1.6)	–
Year 12	4 (6.3)	5 (7.8)
Trade Certificate	9 (14.1)	2 (3.1)
Post-school (TAFE*)	12 (18.8)	13 (20.3)
University	37 (57.8)	44 (68.8)
Employment Status[b]		
Employed	60 (93.8)	42 (65.6)
Looking for work	–	2 (3.1)
Not employed	2 (3.1)	20 (31.3)
Mean hours of Paid Work per Week (mean [SD])[c]	36.39 (9.89)	15.18 (13.32)
Annual Income[c]		
$0 - $25,000	1 (1.6)	1 (1.6)
$25,001 - $50,000	5 (7.8)	6 (9.4)
$50,001 - $75,000	5 (7.8)	3 (4.7)
$75,001 - $100,000	20 (31.3)	21 (32.8)
$100,001 - $125,000	7 (10.69)	10 (15.6)
$125,001 +	25 (39.1)	23 (35.9)

**TAFE* technical and further education

[a]Not asked of mothers

[b]2 missing participants (father)

[c]1 participant missing (father)

Procedure

The study was awarded Human Ethics approval from The University of Newcastle (No: H-2010-1300). A convenience sample of father–toddler dyads was recruited via posters and flyers distributed via local child-care centres, play groups, and online parent support forums. Potential participants were screened for their eligibility via a telephone call. Of those who were eligible and willing to participate in the study, an email containing a study information sheet, consent form and a unique identification code were sent to both the father and the mother. The identification code provided the participants with access to a

Table 2 Demographic characteristics of children ($N = 64$)

Children's demographics	Child
Gender (*n* [%])	
Male	29 (45.3)
Female	35 (54.7)
Age in Months (mean [SD])	20.05 (3.19)
Ethnicity (*n* [%])	
Caucasian/Australian	33 (51.6)
Indigenous Australia	1 (1.6)
Other Ethnicity	6 (9.3)
No Answer	24 (37.5)
Birth order of Child (*n* [%])	
First born	49 (76.6)
Second born	11 (17.2)
Third born or later	4 (6.3)
Attends Day-care[a]	
Yes	42 (65.6)
No	21 (32.8)

[a]1 missing participant (child)

series of online questionnaires that were completed by either: the father only, the mother only, or both parents. The study also required the child to participate in two on-site sessions: a developmental session and a play session. The sessions took place at the University and were arranged in an order that suited the families' schedules. To reduce the effect of extraneous variables such as developmental maturation, the appointments were scheduled within 2-weeks of each other (Shaffer & Kipp, 2013).

Developmental session

The toddler was accompanied to the developmental session by either their father or mother. During the developmental session, the Bayley Scales of Infant and Toddler Development 3rd edition (Bayley-III, Bayley, 2006) was administered by a trained researcher. It took approximately two hours to complete and was administered in the following order: Cognitive scale, Motor (fine and gross) scale, and Language (expressive and receptive) scale.

Play session

The play session was attended by the father and toddler, the mother's attendance was not required. During the play session, fathers were instructed to engage in play with their toddler as they would at home across four seven-minute play paradigms. The play paradigms included: two-bag play, risky play, physical play (i.e., rough-and-tumble play), and free-play. The two-bag play included one bag with blocks and another with two hand puppets, a protocol adapted from McCabe et al. (2004). The fathers were given the two bags and asked to play with the content in each in turn; there were no instructions on what or how to play. In the risky play, a slide with two small steps was introduced into the playroom; fathers were asked to play with their toddler as they normally would with a similar toy. In the physical play, fathers were told "now you have time for some physical play, we are interested in 'rough and tumble play' … do what you would at home with your child". These protocols are similar to those employed by Flanders et al. (2013) and Majdandžić et al. (2016). In free play, fathers were asked to play whatever they want, as they would at home without toys. The play paradigms were counterbalanced to control for order effects (Campbell & Stanley, 2015). For the purpose of the current manuscript, only the physical play (i.e., rough-and-tumble) paradigm was analysed.

Measures

Demographic characteristics

A sociodemographic questionnaire was used to collect information from both parents, and included father and mother age, marital status, education, employment, work hours, family income and care responsibility. Additionally, information about the toddler including age, sex, ethnicity, birth order and day-care attendance was collected.

Child development

Toddlers' developmental skills were assessed using the Bayley Scales of Infant and Toddler Development, 3rd edition (Bayley, 2006). The assessment is designed for children between the ages of 1 and 42 months and measures cognitive, language, and motor skill development. The Cognitive scale is comprised largely of nonverbal activities. The Motor scale is composed of Fine Motor and Gross Motor subtests. The Language scale is composed of two subtests: Receptive Communication, and Expressive Communication. Additionally, the toddler's primary carer also completed a self-report measure (35 items) to assess the toddler's Social-Emotional abilities, including the capacity to understand and employ a range of emotional experiences and expressions (Weiss et al., 2010). The primary caregiver was defined as the parent who provided the most hours of care for the toddler. The Bayley-III is one of the most recognised assessments of infant and toddler development (Connolly et al., 2012), with strong psychometric properties, including good test-retest reliability ($r = .67$; Bayley, 2006) and predictive validity ($r = .83$; Bode et al., 2014). In the analyses, we used nominal scores that ranged from 1–7 from extremely low, to extremely high.

Rough-and-tumble play quality

The quality of RTP in the physical play session was assessed using an observational measure, the Rough-and-Tumble Play Quality Scale (RTP-Q, Fletcher et al., 2013). The observations were independently completed by two coders while watching the videoed dyadic father–toddler RTP interactions. The scale, which consists of 16 items, rates the quality of father–child verbal and non-verbal interactions. Specifically, the items assess paternal warmth, control, dominance, sensitivity, physical engagement and playfulness, using both individual and dyadic items, on a five-point Likert scale ranging from 'poor' to 'excellent'. Minimum and maximum scores range from 16 to 80. The measure has demonstrated convergent validity with fathers' report of their positive parenting involvement ($r = 0.41$, $p = 0.04$), and has high internal consistency (Cronbach's $\alpha = 0.95$; Fletcher et al., 2013). Prior to completing RTP-Q coding, regular meetings and training were conducted until both coders reach a high level of agreement and were competent in play coding. One researcher coded all recorded play sessions, with 30% of recordings being randomly selected for coding by a second researcher to establish interrater reliability. For the videos that were scored by two coders, the average of the RTP-Q ratings was calculated and used in the analyses. There was a high reliability between coders (ICC = 0.96) and high internal consistency ($\alpha = 0.96$).

Rough-and-tumble play frequency

Father–toddler RTP frequency (RTP-F) was assessed using the Parent Involvement Scale (PIS), specifically created for this study, which included a question on frequency of RTP, as created by Paquette et al. (2003). The PIS is a 13-item self-report questionnaire that was completed by both the mother and father. It uses a four-point Likert scale which ranges from 'Not at All' to 'Everyday' to assess how often each parent engages in activities with their child. RTP-F was calculated on responses to the question, 'How often do you play rough-and-tumble with your child each week?'.

Father stress

The experience of paternal stress was assessed using the Parenting Stress Index Third Edition—Short Form (PSI-SF; Abidin & Abidin, 1990). The PSI-SF is a 36-item self-report questionnaire completed by the father only. Items within the PSI-SF are combined to form three subscales: Parental Distress, Difficult Child and Dysfunctional Child–Parent Interactions. The Parental Distress (PD) scale assessed the fathers' perceptions of their own behaviour in the context of parenting demands (e.g., parenting competence). The Difficult Child (DC) scale measured the fathers' view of the child's temperament, demandingness and compliance. The Dysfunctional Child–Parent Interactions (P-CDI) scale assessed the extent to which the father felt satisfied with their child, and their interactions with them. An assessment of Overall Parenting Stress (OPS) was ascertained by combining the scores from the PD, DC and P-CDI scales. The scales were rated using a five-point Likert Scale ranging from 'Strongly Agree' to 'Strongly Disagree'. The PSI-SF is considered to have robust psychometric properties, with previous studies reporting good internal consistency ($\alpha = .85$) and strong content and construct validity (Abidin & Abidin, 1990).

Analysis

The study utilised a correlational design to examine the direction and strength of associations between RTP-Q and fathers' personal characteristics, fathers' parenting, child demographics and child development. Fathers' personal characteristics were age, education level, employment status, weekly work hours, income; fathers' parenting factors were care responsibility, parenting stress, and maternal and paternal rated RTP-F. Child demographic variables were sex, age, birth-order, and day care attendance; and child development variables were cognitive, motor, language, and social-emotional scores. Descriptive statistics were calculated. Correlational analyses and multiple linear regressions were completed to assess the direction and strength of associations between RTP-Q and the father and child variables. A criterion for statistical significance of $p < 0.05$ was used. Analyses were undertaken using IBM Statistical Package for the Social Sciences (SPSS) Version 24.0 (IBM Corporation, 2016).

Results

Descriptive Statistics

Fathers' personal characteristics were described above. Regarding fathers' parenting factors, over half the fathers reported that they had a small but substantial caregiving role (59%). One third reported that care was shared equally (31%), and only 5% of fathers reported that they were the primary carer for the toddler.

Most fathers' total parenting stress was reported to be within a clinically typical range (68%); however, 11 fathers were in the high stress percentiles and nine fathers in the clinically significant stress percentiles. Almost half of the fathers reported that they frequently engaged in RTP with their toddler, with 44% of fathers reporting that they engaged in RTP 'everyday' with their child (Table 3). Of note, only 34% of mothers reported that fathers engaged in RTP 'everyday'. Despite this variation between the fathers'

Table 3 Descriptive statistics for RTPQ, RTP-F, father stress and child development ($N = 64$)

Fathers' parenting factors		Min	Max
Caregiving Responsibility[a,b]			
Primary carer	3 (4.7)		
Smaller but still substantial role	38 (59.4)		
Care shared equally	20 (31.3)		
Minimal	2 (3.1)		
Rough-and-tumble play frequency father report (n [%])			
1 – 3 times a week	8 (12.5)	–	–
4 – 6 times a week	28 (43.8)	–	–
Everyday	28 (43.8)	–	–
Rough-and-tumble play frequency mother report (n [%])			
None	2 (3.1)	–	–
1 – 3 times a week	17 (26.6)	–	–
4 – 6 times a week	23 (35.9)	–	–
Everyday	22 (34.4)	–	–
Parent Stress Index			
Parental Distress Scale (mean [SD])	2.31 (7.25)	13	44
Difficult Child Scale (mean [SD])	26.37 (5.31)	17	42
Child Dysfunctional Scale (mean [SD])	20.40 (4.34)	14	31
Defensive Responding Scale (mean [SD])	15.71 (4.62)	7	30
Total Stress Scale (mean [SD])	73.09 (13.79)	46	101
Rough-and-tumble Play Quality			
RTP-Q (mean, [SD])	56.23 (12.05)	32	80
Child developmental domains			
Bayley developmental scales of infant development composite scores			
Cognitive Scale (mean [SD])	112.96 (14.27)	77	145
Total Language Scale (mean [SD])	115.64 (13.44)	77	150
Total Motor Scale (mean [SD])	109.94 (11.19)	79	133
Social-Emotional Scale (mean [SD])	107.11 (15.55)	75	145

[a]Not asked of mothers

[b]1 participant missing (father)

and mothers' reports about RTP-F, the difference in their reports was not found to be statistically significant ($\chi^2 = 10.19$, $p = .11$). There were no significant differences between fathers of boys or girls regarding their personal characteristics (age, education, employment, workhours and income), parenting (care responsibility, parenting stress or RTP frequency), or RTP-Q, $p > .05$.

With respect to child development outcomes, there was a normal distribution of cognitive, language, motor and social-emotional scores with most children falling within the 'average' range. The social-emotional scale (parent report) was not correlated with the observed cognitive, language or motor skills, whereas there were moderate correlations between these latter three scores. To determine whether there were any differences between boys and girls, independent samples t-test were conducted. Girls had significantly higher scores on motor skills, $t = -2.0$ (*62*), $p = .05$, Cohen's $d = 0.5$, and there was a trend for girls to also have higher language and cognitive nominal scores ($p < .07$). There was no between-group difference in social-emotional development ($p > 0.5$).

Correlational Analyses

Correlational analyses were completed to assess the association between RTP-Q and fathers' personal characteristics (age, education level, employment status, weekly work hours, income), parenting factors (caregiving responsibility, parenting stress, and RTP-F), and also with toddler demographics (sex, age, birth order, attendance at day care), and developmental level (Table 4).

Fathers' characteristics and parenting

Regarding fathers' personal characteristics and their parenting: fathers who were younger tended to work longer hours ($r = -.40$, $p = .001$); fathers with higher education levels were more likely to be employed ($r = .694$, $p < .001$) and have less caregiving responsibility ($r = -.356$, $p = .009$); those with greater caregiving responsibilities worked shorter hours ($r = -.328$, $p = .009$). Fathers with longer workhours tended to have children with higher social-emotional skills ($r - .263$, $p = .037$). Children were more likely to attend day-care if their fathers had higher incomes ($r = .453$, $p < .001$), or had greater caregiving responsibilities ($r = .277$, $p = .029$).

There were no significant correlations between RTP-Q and fathers' personal characteristics of age, education, employment, weekly work hours, or income ($p > .12$). No significant correlations were identified between RTP-Q and fathers' caregiving responsibility or their overall parenting stress. We found that the association between RTP-Q and RTP-F differed depending on who reported frequency. No significant correlation was found between father-reported RTP-F and RTP-Q. However, a moderate and significant association was found between mother-reported father–toddler RTP-F and RTP-Q; fathers with higher quality RTP tended to play RTP more often, according to mothers.

Child demographics and development

There was a significant moderate positive correlation between RTP-Q and child age ($r = .30$, $p = 0.01$); as child age increased so too did RTP-Q. There was no association between RTP-Q and sex, birth order or attendance at day

Table 4 Pearson correlations between RTP-Q scores and father characteristics and child development

	RTP-Q	
	r	*p*
Father Personal Characteristics		
Age	0.02	0.99
Level of Education	−0.20	0.12
Employment Status	0.09	0.48
Hours of Work each Week	−0.20	0.12
Income	0.01	0.94
Father Parenting Factors		
Caregiving Responsibility	−0.16	0.21
PSI-Parental Distress	0.24	0.06
PSI-Difficult Child	0.02	0.87
PSI-Parent-Child Dysfunction	−0.06	0.66
PSI-Overall Parenting Stress	0.15	0.25
RTP-F father report	0.17	0.18
RTP-F mother report	**0.28**	0.02
Child Demographics		
Sex	0.09	0.49
Age	**0.30**	0.01
Birth Order	0.07	0.55
Attendance at Day-care	0.12	0.35
Child Developmental Domains		
Cognitive	−0.01	0.91
Motor	−0.00	0.99
Language	0.00	0.99
Social-Emotional Behaviour	**0.28**	0.02

RTP-Q Rough-and-tumble Play Quality, *RTP-F* Rough-and-tumble Play Frequency

The bold values are significant at $p < 0.05$

care. With respect to child developmental scores, there was a significant positive correlation between RTP-Q and child social-emotional development, indicating that when children were more socially-emotionally mature, RTP-Q was higher. There was no association between RTP-Q and child cognition, motor and language skills as measured by the Bayley-III, $p > .05$.

Multiple linear regression

A multiple linear regression analysis (see Table 5) was completed to assess the strength of the association of father and child factors with RTP-Q. The multiple linear regression model included the independent variables previously identified as being significantly correlated with RTP-Q (i.e., mothers' report of father RTP-F, child age and child social-emotional development). The results of the multiple linear regression indicated that the three predictors explained 26% of the variance in RTP-Q ($R^2 = .255$, $F(3,63) = 6.84$, $p < .001$). RTP-Q was significantly predicted by RTP-F (reported by mothers; $\beta = .31$, $p = .008$), child age ($\beta = .31$, $p = .007$) and child social-emotional development ($\beta = .27$, $p < .02$), indicating that each of the variables made a unique, and statistically significant, contribution to the prediction of RTP-Q when the variance of other variables was controlled for. The squared part-correlation coefficients indicated that the unique contribution of the variables to the total R square was as follows: RTP-F contributed 55%; social-emotional development 52%; and child age 56%.

Table 5 Multiple linear regression model predicting RTP quality using RTP-F, child age, child social-emotional development as independent variables

	B	SE(*B*)	*β*
RTP-F	4.27	1.56	0.31**
Child Age	1.18	0.42	0.31**
Child Social-Emotional Development	2.64	1.11	0.27*
R2	0.26		
F	6.84		
df	3, 63		

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

Discussion

The aim of this study was to explore father and child characteristics associated with the quality of father–child RTP in children aged 18–24 months. Based on the balance of literature with older children (preschool-middle childhood), we expected that fathers who were older, with higher education and income and who engaged more frequently in RTP with their toddlers, would participate in higher quality RTP interactions with their toddlers. We expected that parenting factors such as weekly work hours and caregiving responsibility, would not be associated with the quality of RTP. And, based on the robust literature on paternal mental health, we expected that fathers' parenting stress would be associated with poorer father–toddler RTP quality. Based on previous research and general rules of developmental stages, we expected that RTP quality would be higher for father–child dyads where the child was older, male and developmentally more mature in the domains of cognition, language, motor and social-emotional skills.

Involved fatherhood is increasingly a social norm in Western societies, and many fathers now spend more time in the home with their children. It is therefore important to better understand the range of influences on their interactions across different developmental stages. Play is one way in which parents affect their children's development. Previous studies have suggested that fathers' personal characteristics, and parenting factors, along with child demographics and developmental competencies, influence

the quality of father–child physical play in the preschool years. The current study extends this work by exploring these factors in a cohort of toddlers. In this study, frequency of father–toddler RTP, toddler age and social-emotional development were all significantly, and fairly equally, associated with RTP-Q. However, contrary to expectations, no associations between RTP-Q and fathers' personal characteristics of age, education, employment, weekly work hours, income, were identified. Further, parenting factors such as caregiving responsibility and parenting stress were not associated with the quality of RTP. We did not identify associations of RTP-Q to child sex, cognitive, motor or language development.

The finding that the frequency of father–child RTP was associated with quality is consistent with previous studies of father–child RTP in older children, where father–child dyads who engage in more RTP have higher quality interactions (Cielinski et al., 1995; Flanders et al., 2013). Whilst we were not able to examine factors that might influence this association, research suggests that paternal personality influences parenting style (Belsky et al., 1995), which may moderate the association between the frequency and quality of father–child RTP. For example, it is feasible that father–child RTP with fathers who are more extraverted would play more joyfully and often than with fathers who are more neurotic (Achtergarde et al., 2015). Therefore, future research might investigate the effect of father personality on father–child RTP.

Although the hypothesis regarding the association between RTP-F and RTP-Q was met, it was not predicted that there would be a discrepancy in how mothers and fathers rated the frequency of father–child RTP. Whilst this finding was unexpected, it does make sense in the context of known limitations of using self-report measures to assess parent–child interactions (Cabrera et al., 2014; Wical & Doherty, 2005). Specifically, it is widely recognised that parents will either underreport or overreport the time they spend completing an activity with their child (Hook & Chalasani, 2008; Marini & Shelton, 1993). In addition, issues of recall may have also confounded the parent reports (Furr & Bacharach, 2017). Therefore, future studies would benefit from collecting information from not only a range of informants (e.g., fathers and mother), but also employ real-time recording measures to foster a more balanced and objective measurement of how often parents participate in RTP with their children. Unfortunately, the current study did not measure other types of activities that the father–toddler dyad completed: this would have been useful as it would have enabled a closer examination of the types of dyadic activities the fathers engaged in with their toddlers.

Contrary to expectations, father characteristics such as age, education and income were not found to be significantly related to RTP-Q. These findings are not consistent with broader literature on the effect of father characteristics on play quality (Grossmann & Grossmann, 2019; Yeung et al., 2001), but do accord with other studies on RTP (e.g., Anderson et al., 2019). Given the mixed evidence, and the supported hypothesis that availability to the child (weekly work hours and caregiving responsibility) would not be associated with frequency or quality of play, it is possible that there is no association between these variables. However, it is also likely that the demographic homogeneity of the fathers in the current study better accounts for our findings. Specifically, there was low variability, as most were middle-class, well-educated and high-income earning participants. Singh and Masuku (2014) suggest that reduced variability in a sample can confound investigations into links between variables, due to reduced power to detect effects. Overall, these findings suggest that further research should seek to explain the variation in influential paternal characteristics across play types, comparing RTP to more general play interactions.

The current study did not find a significant association between father parenting stress and RTP-Q; the parental distress (subscale) had a non-significant weak effect size. This finding is inconsistent with the broader literature on parent–child interactions that suggests that parents who experience higher levels of stress are less engaged and less responsive with their child (Deater-Deckard & Panneton, 2017). The findings are also inconsistent with the limited number of studies that have investigated the role of father stress on father–child interactions, including physical interactions such as RTP (Belsky et al., 1995; Darke & Goldberg, 1994). One explanation for these inconsistent findings might be that there was not enough variation or severity of stress amongst this sample of fathers (Singh & Masuku, 2014). Although two-thirds of the sample were found to have total stress levels within a 'clinically normal' range, and the other third with high or clinically relevant stress, this variability appeared to not be great enough to detect an association. On the other hand, it is possible that physically boisterous interactive play is more 'resilient' to parenting stress; perhaps this play is used as an involvement strategy to overcome perceptions of distress in parenting, being part of a larger system of transactional or bidirectional influences (Jia et al., 2012). Movement and physical action are linked with stress release in both child and adult populations (Martikainen et al., 2013; Young & Morgan, 2017), so it is plausible that RTP, through its boisterous, interactive physicality, helps to break a cycle of stress and negative affect (Schultchen et al., 2019). Given these variations in findings, future research should aim to extend our knowledge of the links between paternal parenting stress, and parenting, including physical play.

We did not find an association between child sex and RTP-Q. In contrast to our initial hypothesis, the findings

suggest that the quality of RTP was similar between father–son and father–daughter dyads. This result is inconsistent with literature that reports that there is a difference in how fathers engage in physical play with their sons and daughters (Lindsey et al., 1997; Manlove & Vernon-Feagans, 2002; McBride et al., 2002). However, some research suggests that sex-typed behaviour increases over the preschool years (Golombok et al., 2008), that is, later than our sample's age, and differences in parent–child play based upon child sex may not be salient until children enter the school years (Roopnarine & Davidson, 2015). This suggests that we found no sex differences in father–child RTP play because play-based sex differences are not present in 18–24 month-old toddlers.

Analysis revealed that there was a significant association between child age and RTP-Q whereby the quality of RTP was greater when children were older. This finding was both expected, and consistent with the existing literature which suggests that older children engage in higher quality physical play, including RTP. As a child matures, they develop greater effortful control and motor skills increasing their ability to engage in more vigorous and intensive play, and in terms of how the quality of RTP is scored, this will inherently contribute to and facilitate greater quality play (Payne & Isaacs, 2017).

Consistent with earlier research (Paquette et al., 2003; Shannon et al., 2002), we found that the quality of father–toddler RTP was higher when children were more social-emotionally mature. Researchers often describe the association between father–child RTP and child developmental outcomes in unidirectional or causal terms, whereby one leads to the other. The current design does not allow causal inferences, however more broadly, it could be argued that that the effect of parent interaction on child development is transactional rather than unidirectional (Jia et al., 2012; McBride et al., 2002). Considering the association in terms of a transactional model might help to further explain the results of this study. Specifically, it could be posited that father–child RTP-Q was higher when children were more socially emotionally mature because the features which determine the quality of RTP, such as turn taking and winning and losing, are behaviours that are more developed in children with greater social-emotional skills. Specifically, these children may be able to elicit more responsive behaviours from fathers and provide fathers with clearer feedback during play (Dumont & Paquette, 2013; Freeman et al., 2010), which in turn would promote greater quality RTP between the father and child (Ginsburg, 2007).

Although the current study found that child social-emotional development was clearly associated with the quality of RTP, neither motor skills, cognitive capacity nor language ability were associated with father–toddler RTP-Q. Possibly, the developmental domains of cognition, motor skills, language, and social-emotional skills do not equally contribute to the quality of play. Specifically, RTP is often defined by the father's ability to show warmth, playfulness, positive emotion, an awareness of the need to let the child win and lose sometimes, and dominance swapping (i.e., social-emotional skills; Fletcher et al., 2013; Paquette, 2004). This might therefore explain why higher quality RTP was associated with higher social-emotional abilities. Other aspects, such as motor skills may, paradoxically, not be especially pertinent to the quality of RTP.

Alternatively, while all scores were normally distributed, the social-emotional scale was not correlated with cognitive, language or motor skills, whereas there were correlations between these latter three scores. It is possible that this discrepancy is attributable to the assessment method: the cognitive, language and motor scales of the Bayley Assessment were assessed objectively by a researcher, compared to parent ratings by questionnaire of social-emotional development (Stone et al., 1999). Whilst using a combination of subjective and objective assessment was a strength of this research, it is important to consider the implications of using subjective assessments (Stone et al., 1999). For example, it is possible that parents overreported or underreported on child behaviours and this is what accounts for the differences in correlations of with the observed compared to the reported developmental domains with RTP-Q. Future studies might employ measures that can collectively assess both objective and subjective perspectives for each measure to reduce the effect of assessment method.

It is also is possible that the study environment and instructions confounded the type and quality of play that fathers engaged in with their child. The unfamiliar setting and the video recording may have affected participant behaviours; people are more likely to engage in behaviours and actions that they perceive will be 'desirable' in laboratory settings (Gardner, 2000; McCambridge et al., 2014). Known as the Hawthorne effect, it is possible that the type and quality of father–son and father–daughter play 'changed' or 'differed' from normal because fathers were mindful that they were being observed (McCambridge et al., 2014). In the future, studies might attempt to investigate RTP quality with very young children by observing these play interactions in a more naturalistic setting, such as in the home environment (Gardner, 2000), comparing findings across home and lab or clinic.

Limitations and Future Directions

Whilst the current study provides evidence of an association between father and child characteristics, and the quality of father–child RTP, it is important to consider these findings within the context of the study's limitations. Foremost, it is

possible that the measure that was employed in the study to assess the quality of RTP was not the most appropriate tool to use. Specifically, the RTP-Q measure was validated with a population of children who were aged between 42 to 56 months (Fletcher et al., 2013). Our population of children was aged between 18 to 24 months, and there is a significant developmental difference between these groups, as indicated by the age effect even within our sample's range of 6 months. It is plausible that the nature of the RTP that was engaged in by the older cohort of children in Fletcher and colleagues (2013) study differs to the type of RTP that was engaged in by our younger cohort of children. This idea is supported by Tannock (2008) who reported that due to less developed motor skills and ability, younger children engage in RTP that is less sophisticated and defined than older children who have the capacity to participate in more complex forms of RTP. Recall that the RTP-Q measure includes behaviours or constructs such as dominance, reciprocity and role reversal: these behaviours are related to a more mature cognitive competence that is related to brain maturation (Chevalier et al., 2019; Cielinski et al., 1995) and the behaviours tend to emerge in stage-like processes related to experience and age (Elfers et al., 2008). This suggests that the RTP-Q measure may not have the sensitivity to assess the quality of play within a younger population. Future studies should validate the measure for assessing RTP quality in this age group or adapt the current measure to assess age-appropriate RTP displays and behaviours. It would also be interesting to explore the developmental trajectory of father–child RTP to elucidate play complexities and the relationship to father engagement and sensitivity.

Although this study found an association between child social-emotional development and father–child RTP quality, these findings should be interpreted with caution due to the way in which the outcome was assessed. Specifically, the study required the primary caregiver (i.e. either the mother or the father) to complete the social-emotional development questionnaire. It is possible that there was a difference in the way that mothers as primary caregivers rated child social-emotional development, compared to fathers who were primary caregivers (Gardner, 2000). Future studies might designate either one parent (i.e. either mother or father) as the participant who completes the questionnaire, or have both parents complete a measure of social-emotional development and use the mean score.

It is also important to consider the effect of participant-bias in the study. This study was quite time intensive, whereby father–child dyads were required to attend two on-site sessions in addition to completing a range of questionnaires. With limited attrition in the study, it could be argued that the sample were highly motivated and willing to invest their time and effort into the research. If so, it is possible that those who participated in the study were individuals with limited psychological distress, including parenting stress, and generally competent in parenting; in turn, this may have led to a positive skew in the results (Privitera, 2015). In the future, additional recruitment strategies and methods should be employed to increase the variation in fathers included in the study and thus the generalisability of the findings.

Further research might utilise more complex statistical analysis and modelling to determine whether and which variables moderate or mediate father–child RTP quality. For example, statistical exploration of the transactional association between parent and child on child outcomes over time may be helpful in developing theoretical understandings regarding how the parent and the child adapt to developmental changes, and the developmental progression in the complexity of the play.

More broadly, this study adds to the mounting evidence of the benefit of positive, physically active interactions between father and child. The warmth and cooperation that occur within high quality RTP can help to build a strong father–child relationship and the physical activity itself likely contributes to physical and mental health (Young & Morgan, 2017). Father–child physical play, including RTP may therefore present an opportunity for professionals to bring fathers into their work with families. Providers are often motivated to include fathers in their family work but may lack the know-how of doing this. Providing information and opportunities for father–child play works with fathers' strengths and capabilities and provides an opening for enhancing fathers' skills and confidence, with flow-on effects for the whole family.

Author Contributions L.C. collaborated with the design, assisted with the data analyses, co-wrote the paper and edited the final manuscript. J. St.G collaborated with the design, assisted with the data analyses, co-wrote the paper and edited the final manuscript. T.H. collected the data, assisted with the data analyses, and writing up. E.F. collaborated with the design, assisted with the data analyses and writing of the paper.

Compliance with Ethical Standards

Conflict of Interest The author declares no competing interests.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the Human Ethics Committee of the University of Newcastle (Australia) in accordance with the National Statement on Ethical Conduct in Human Research, National Health and Medical Research (Australia) and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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