



Predicting children’s social adaptation and academic achievement from father-child preschool rough-and-tumble-play and father involvement in child schooling

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Abstract

Most studies interested in understanding the role of parents in children’s school adjustment have focused on mothers. Given the importance of father-child play during the preschool period, this study explores the possible links of father-child rough-and-tumble play and also father’s involvement in child schooling with two dimensions of school adjustment: social adaptation and academic achievement. Observational data was collected from father-child rough-and-tumble play sessions filmed in family homes when children were average age of 4 years. Fathers completed the Family Involvement Questionnaire on parent involvement in child schooling, and teachers completed the Social Behaviour Questionnaire and the Teacher Report form to assess social adaptation, and the Teacher Rating Scale to assess academic achievement when children (40 boys; 32 girls) were average age of 8 years. Boys demonstrated more externalising behaviours at school when during rough-and-tumble play fathers let them direct the play. Boys were more prosocial at school when their fathers were more involved in school-based activities, while girls demonstrated more internalising behaviours at school when their fathers were less involved in home-based learning activities. Moreover, boys performed less well academically when fathers demonstrated more negative reactions than boys, the dyad demonstrated more upset terminations, and boys demonstrated more fear and less anger during rough-and-tumble play. Girls performed less well academically when during rough-and-tumble play fathers made more rules and fewer positive reactions towards them. Neither boys’ nor girls’ academic achievement was related to any type of fathers’ school involvement. The study fills a gap in understanding the ways in which father involvement influences children’s school adjustment according to the children’s sex.

Keywords Academic achievement · Father involvement · Observational study · Rough-and-tumble play · Sex differences · Social adaptation

Introduction

Child school adjustment, broadly defined as social adaptation and academic achievement, is important for success over the life course and is shaped by child, parent and environmental factors (Reich & Flanagan, 2010). Of all the factors that have a bearing on school adjustment and success, parental influence is the strongest (Castro et al., 2015; Wilder, 2014). However, a general observation of school adjustment research is that most studies focus on mothers, or findings are not gender disaggregated - therefore little is known about fathers’ role in children’s school adjustment. Nevertheless, since fathers are spending more time in active childcare (Craig et al., 2014), it is important to know that this time is beneficial. Furthermore, children

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need and thrive on positive parental support from infancy to young adulthood, and this support is particularly pertinent when young people feel under pressure from other social and environmental factors (Twenge et al., 2019). A more complete understanding of fathers' roles may for example, give schools rationales and strategies for including fathers in home-school communication and may encourage more fathers to see value in their own actions.

In focusing on fathers' roles, this study draws on the "activation relationship" theory (Feldman & Shaw, 2021; Paquette et al., 2020). The activation relationship is the emotional bond between the child and the parent, especially the father, that fosters children's opening to the world, with special focus on parental stimulation and limit-setting during the child's exploration. According to that theory, the activation relationship develops primarily through rough-and-tumble play and it is expected that the father-son activation relationship is more strongly linked to children's exploration and development than the father-daughter activation relationship.

Therefore, this longitudinal study focuses on two aspects of fathering that at first glance appear disparate. One aspect is father-child rough-and-tumble play at child age 4–5 years and the other, father involvement in schooling at child age 8 years. These two diverse aspects specifically focus on the *quality* of father involvement (Palkovitz & Hull, 2018). A focus on the quality of father involvement, at different life stages, can complement the vast evidence on the *quantity* of father involvement. It gives a more nuanced understanding of the processes or mechanisms by which fathers influence their children's development (McWayne et al., 2013; Palkovitz, 2019). In general, these explanations are missing from research on fathers' role in child development.

These activities are studied over time because fathers who are actively involved with their children in the early years are likely to flexibly adapt to their children's later needs, including within formal schooling (McBride et al., 2009). In the early childhood/preschool period, father involvement in the child's world is primarily through play, most often physical play (Lamb & Lewis, 2013). Rough-and-tumble play at the preschool age has benefits for social and cognitive skills (Bocknek et al., 2017; Perry et al., 2019; StGeorge & Freeman, 2017), which translate into later academic skills (Anderson et al., 2019; Burchinal et al., 2020). Therefore, we are interested first in how father-child rough-and-tumble play might have developmental consequences for school adjustment (social adaptation and academic achievement). In middle childhood, the child's world revolves around schooling, and father involvement during this period can be seen in his support of and participation in home and school-based activities (McBride et al., 2009). Therefore, we are also interested in how fathers' involvement in schooling is

associated with children's school adjustment, that is, their social adaptation and their academic achievements. In the sections below, first is briefly outlined key elements of children's school adjustment (social adaptation and academic achievement), including evidence on fathers' influence, before discussing current evidence on fathers' rough-and-tumble play and his school involvement.

School adjustment

Child social adaptation

An important component of school adjustment is a child's social and emotional competence, the ability to sustain "positive engagement with peers, marked by positive, regulated emotions" (Denham, 2006, p. 61). In a school environment, children are required to delay their own needs, urges, and feelings, in order to play with other children without resorting to inappropriate outbursts, hitting, biting, or yelling to resolve conflicts. Children's aggressive behaviours or negative relationships with others are indicators of *non-readiness* for school (Denham et al., 2012), which predict longer-term learning deficits (Pagani et al., 2010).

Fathers' role in children's social and emotional competence is frequently studied, with research showing that when their fathers are emotionally involved, children are more likely to get on with their peers (NICHD Early Child Care Research Network, 2004), have better daily living skills (Kelley et al., 1998), exhibit better emotional regulation (Cabrera et al., 2007), demonstrate less problematic internalising and externalising behaviours, and score higher on 'emotional intelligence' tests (Gottman et al., 1997; Prinzie et al., 2003). These findings are supported in a critical review by Downer et al. (2008), which concluded that supportive fathers were associated with children's social competence and fewer externalising behaviours.

Child academic achievement

As a component of school adjustment, academic achievement (also known as academic success, performance or attainment) is concerned with skills in language, literacy and numeracy. Robust, longitudinal evidence shows that academic skills in the early years are critical to children's later academic success (Rabiner et al., 2016). Evidence of the impact of fathers' parenting on children's academic achievement, separate to mothers, focuses on the quality and amount of his engagement. Overall, many studies show that children score well on a range of language, literacy and numeracy outcomes when their father is highly supportive (Martin et al., 2007; Pleck & Masciadrelli, 2004), or sensitive (Magill-Evans & Harrison, 2001; for a review,

see Varghese & Wachen, 2016). For example, at child age two and three years, father's teaching interactions positively predicted children's reading, vocabulary, and maths at age five, seven and 10 years (McKelvey et al., 2011). In another study, a similar effect held for fathers' cognitively stimulating play with their toddlers, over and above mothers' cognitively stimulating play, child sex, and Early Head Start program enrolment (Cook et al., 2011). Likewise, the link between positive father involvement and children's IQ appears robust (Flouri & Buchanan, 2004; Nettle, 2008).

Father involvement

Father-child rough-and-tumble play (RTP)

Fathers have been identified as playmates and challengers for their children (Grossmann et al., 2002; Paquette, 2004). While there are a variety of ways in which fathers engage in stimulating and challenging play, one prevalent form is rough-and-tumble play (RTP). Rough-and-tumble play between father and child is physically interactive play that is boisterous yet under control, challenging yet reciprocal, and mutually enjoyed. Fathers' 'rough' physical play with infants, such as bouncing or lifting, can develop into more complex and rigorous physical play as children's motor, socio-emotional and cognitive skills mature (Kochanska et al., 2000; Rothbart et al., 2003). A quasi gold-standard definition of rough-and-tumble play as a variant of physical activity play describes the play as "wrestling, grappling, kicking, and tumbling that would appear to be aggressive except for the playful context" (Pellegrini & Smith, 1998b, p. 579). Smith (2010) explicitly defined rough-and-tumble play to include positive facial expressions (play face, laughter, smile), self-restraint, role-reversal, invitation as initiation, and togetherness at the end of play (p. 108). The difference between rough-and-tumble play (or 'play-fighting') and aggression (that is, behaviour oriented towards acquiring and maintaining resources accompanied by anger) is the demonstration of cooperation within the competition (Flanders et al., 2010; Pellis & Pellis, 2017). In high quality father-child rough-and-tumble play, fathers are observed to be warm, challenging, reciprocal, playful, and to set behavioural limits (Flanders et al., 2013).

The frequency of father-child rough-and-tumble play tends to peak during the preschool period (MacDonald & Parke, 1986; Pellegrini & Smith, 1998a). Fathers generally report more often engaging in rough-and-tumble play with their young children than mothers, and more so with boys than with girls (Flanders et al., 2009; Paquette et al., 2003). Additionally, there are suggestions that child sex can alter the type of rough-and-tumble play a father engages in. Father-daughter rough-and-tumble play behaviours more

often mimic caring, protecting, and rescuing, and involve more language, compared to father-son rough-and-tumble play (Harbin, 2016; Jarvis, 2006). Rough-and-tumble with boys appears to involve greater levels of fighting and play-strength competition, with higher levels of activity, intensity and competition (Fry, 2005; Shaffer & Kipp, 2013). These observations parallel other findings showing daughter/son differences in fathers' brain and behavioural caregiving responses (Mascaro et al., 2017).

The observed tendency for men and boys across cultures and societies to engage in physical and rough-and-tumble play is likely accounted for by biosocial factors as parenting is still strongly influenced by gender role socialisation (Yaffe, 2020). Testosterone levels *in utero* are believed to prime the foetus for sex-specific play styles (Xiong & Scott, 2020), and testosterone in fathers has been observed to promote physical play (Kuo et al., 2018). Cultural norms can also modulate the intensity and frequency of physical play among men and boys: there are fragmentary aspects of rough-and-tumble play evident in many cultures, but it is most apparent in Western individualistic societies (Roopnarine & Davidson, 2015).

Evidence shows that father-child physical play is robustly linked to children's social competence, and low aggression, as well as to self-regulation (Anderson et al., 2019; StGeorge & Freeman, 2017). Specifically concerning rough-and-tumble play, high quality father-child rough-and-tumble play is negatively associated with behaviour problems in children (especially conduct problems and peer problems), even after controlling for father involvement in caregiving (Fletcher et al., 2013). Observational studies have shown that the 'dominance relationship' during the play is an important indicator of quality for predicting aggressive behaviour, at least in China and in Canada (Anderson et al., 2017; Flanders et al., 2009, 2010). When the father exerts more dominance over his child, the frequency of rough-and-tumble play at four years is negatively associated with physical aggression and emotion regulation problems five years later (Flanders et al., 2010). Although there is not yet a direct explanatory mechanism of the effects of rough-and-tumble play on social adaptation, a well-supported proposition is that this play offers opportunities for children to learn to push their limits, control their emotions and behaviour, and to cope with intense emotional arousal in a positive context (Kerr et al., 2019; Majdandžić, 2017; Paquette, 2004). This idea of paternal positive control as a mechanism for child regulation is supported by evidence showing that, while maternal and paternal parenting are both linked to externalising behaviours and impulsivity, positive control by the father buffers the association between externalising behaviours and impulsivity, while maternal positive control does not (Karreman et al., 2010).

Regarding the link between rough-and-tumble play and academic achievement, there is some evidence that children's academic and cognitive skills such as executive function are influenced by physical, roughhousing or rough-and-tumble play with their father. For example, language skills, attention regulation, and cognitive skills in prekindergarten and later in elementary school were predicted by the quality of fathers' rough-and-tumble play with their young children (Anderson et al., 2019). Theoretically, these academic and cognitive effects occur because physical activity such as occurs in rough-and-tumble play, walking or running, is associated with the development of executive functions (Barenberg et al., 2011) and consequently academic and cognitive skills (Burchinal et al., 2020; Hertz et al., 2019).

Father school involvement

Parental involvement in children's schooling is generally understood to be home-based or school-based (Hindman et al., 2012; Kim & Hill, 2015; McBride et al., 2005). Home-based involvement includes activities such as home learning, reading, homework assistance, and cultural excursions whereas school-based involvement generally describes parents' participation in (on-site) school processes, whether for parent meetings, or as a volunteer in service or governance (Foster et al., 2016; Kim & Hill, 2015; McBride et al., 2005).

Regarding links between father school involvement and children's social adaptation, there is little evidence. One study found that girls had more internalising problems when their fathers were less involved at home (Fantuzzo et al., 2000), but no other research evidence for a link could be found; thus this area of investigation is exploratory.

Regarding father school involvement and children's academic achievement, one comparative meta-analysis of mothers and fathers showed that children's academic achievement was equally influenced by mother and father involvement, despite fathers' mean level of involvement being significantly lower than mothers' (Kim & Hill, 2015). These findings are supported by another meta-analysis indicating that children's academic achievement and psychosocial functioning was equally influenced by both parents (Vasquez et al., 2016). Other studies have shown that even after controlling for maternal contributions, variations in children's academic achievements are predicted by father school involvement (McBride et al., 2005). Regarding fathers' school-based involvement specifically, two studies have shown that his school-based involvement predicts children's academic achievement (reading and math), through on-site presence (e.g., for meetings) (McBride et al., 2005), even when controlling for mother-school involvement,

children's home learning environment, and demographics (Baker, 2018).

In sum, the reviewed evidence on fathers' influence through rough-and-tumble play and school involvement suggests that the quality and type of fathers' interactions are important to their children's social adaptation and academic achievement. However, there is less evidence on the long-term effects of rough-and-tumble play on the elements of school adjustment, and evidence for how fathers' school involvement influences their children's school adjustment is lacking. Therefore, the purpose of this study is to examine the association between father-child rough-and-tumble play at 4 years, father involvement in school at 8 years, and children's school adjustment at 8 years. Given that fathers tend to be more engaged with and knowledgeable about their sons (Crouter et al., 1999), it will be important to separate the analyses according to child sex. Furthermore, it will be important to control for mothers' contributions.

Method

Participants

The study took place in Canada, and data was collected from fathers and children's childcare teachers. One hundred and fifty-nine (159) fathers were recruited to the study, which resulted in the participation of 151 father-child dyads when the child was around 4 years of age (average 52 months, range 36–66). The size of the sample was further reduced as only 125 childcare teachers agreed to provide assessments of the children. All participants were French speaking and 86% were born in Canada. The average age of the fathers was 35.7 years (range 23–58). All children in the sample (63 boys; 62 girls) attended a kindergarten or preschool (42 different centres) at the time that data was collected, and no child presented with a physical or intellectual handicap/disability. Compared to the population of the province, the sample contained more two-biological-parent families, more fathers were working, fathers' education levels were higher, and income levels were higher. Ninety-four fathers accepted to participate in the school follow-up phase four years later, but only 72 primary/elementary teachers agreed to participate. In the follow-up phase, the children (40 boys; 32 girls) were average age of 8 years (97 months, range 76–113).

Procedure

Data for this study was collected through questionnaires and videoed observations of father-child play. Advertisements inviting fathers to take part in a study on father-child play

appeared in neighbourhood newspapers and were distributed at childcare centres in the cities of Montreal, Longueuil, and Laval. At time one, child age about 4 years, playful father-child interaction was filmed in the family home by one of two (male) research assistants. After obtaining the parents' free and informed consent, the assistant allowed the child to become familiarized with him and with the video camera installed on a tripod in a corner of the room. Instructions were given in a standardized manner. In keeping with the protocol developed under the physical play paradigm (e.g. Kerns & Barth, 1995; Parke et al., 1989, 1994), dyads were first invited to play with a selection of toys supplied by the assistant. After seven minutes of play, the research assistant asked the participants to put away the toys. The assistant then invited the dyad to engage in rough-and-tumble play if it was a customary form of play for them. If not, it was suggested that they tickle one another. In those instances where fathers said they did not engage in physical play with their children, dyads were encouraged to play as they usually would, but without toys. These rough-and-tumble play sessions were filmed for about eight minutes per the recommendations made in prior studies (e.g., Kerns & Barth, 1995). The assistant stayed behind the camera to film the play and only intervened if toys (other than cushions) were introduced during the physical play session. Only the father-child rough-and-tumble play sessions were retained for analysis. After the session of play, fathers completed paper questionnaires. Childcare teachers completed questionnaires on the children's socio-emotional competence. Participants were compensated \$20, and parents were offered a copy of the video recording. Four years later, the fathers and also their child's teacher were contacted by telephone to invite them to fill out questionnaires. Fathers completed questionnaires on family involvement in schooling and elementary teachers completed questionnaires on children's socio-emotional competence.

Instruments

Father-Child Rough-and-Tumble Play (T1)

Quantitative and qualitative characteristics of RTP were measured. For frequency and duration, fathers answered a questionnaire (Flanders et al., 2009; Paquette et al., 2003). Most fathers reported playing with their children at least once a week (67.2%), and the average reported duration of rough-and-tumble play sessions was 8.7 min (SD = 6.0). For the quality, observational data was collected from the father-child rough-and-tumble play sessions filmed in family homes. Coding was conducted using the 2003 edition (Version 5.0) of The Observer Video-Pro software, internationally renowned for the efficiency and uniformity it affords

the coding of observational data (Noldus et al., 2000). The software allows interactions to be coded using the computer keyboard while viewing images on the monitor and automatically indicating the time at which behaviours take place. Two coders separately coded all the dataset.

The coding scheme was developed based on prior research (e.g., Flanders et al., 2009; Kerns & Barth, 1995; Lindsey et al., 1997). A range of father and child behaviours were coded within episodes of play. To be coded as an episode of play, a bout needed to begin with an invitation to play, last at least ten seconds, and end with a disengagement (termination) or change of game. Episodes were either physical play, non-physical play, or nonplay. Physical play consisted of playful physical contact or locomotor activities involving contact between partners (Lindsey & Mize, 2000). In the current study, only rough-and-tumble play episodes were analysed; inter-rater agreement (Kappa) was 0.71. The average duration of rough-and-tumble play was 3.49 min (SD = 2.66), with videotaped sessions lasting an average of 8.71 min (SD = 0.55). Rough-and-tumble play episodes occupied proportionally more time than other types of play in the videos.

Father and child behaviours that were coded in rough-and-tumble play included initiations and changes, regulations, terminations and partner reaction/responses to these behaviours. The initial coding scheme comprised 38 behaviours. Only the 27 behaviours that were most frequent and most representative of rough-and-tumble play were retained, to provide the most accurate picture of this type of play episode. Thus, behaviours such as wrestling, grappling or pushing one's partner were kept, whereas behaviours such as dancing and hand-clapping games were eliminated. Due to variations in video duration, the frequency of each behaviour was first divided by the duration of observation, before the following scores were calculated. Emotions of the child were also coded.

Initiations and changes. Initiations (directive and suggestive) were defined as verbalizations or behaviours aimed at starting or modifying the course of an interaction. A game might begin via an initiation or a change of game. To reduce the number of variables to be analysed, initiations and changes were combined, in keeping with the procedure developed by Flanders et al. (2009). Inter-rater agreement (Kappa) for initiations/changes during play fighting was 0.76.

Regulations. Regulations were defined as verbalisations or behaviours designed to adjust the level of activity or intensity of play, so it could continue without provoking distress or anger in the child (Flanders et al., 2009; Paquette et al., 2003). Only regulations by fathers were considered in analysis. Inter-rater agreement (Kappa) for regulations overall was 0.72.

Reactions/Responses. In keeping with schemes from previous studies, partners' responses to attempts to influence the flow of play were coded as positive or negative. A behaviour or statement indicating the partner's agreement with the suggestion (e.g. the child accepting the parent's invitation to play fight) was coded as a positive response. A behaviour or statement indicating that the partner disagreed with the suggestion (e.g. the parent not decreasing the intensity of play after a control by the child) was coded as a negative response. Inter-rater agreement (Kappa) for reactions/responses during rough-and-tumble play was 0.73.

Termination. A retreat termination was coded when one of the partners calmly interrupted the game, that is, when an episode of play ended without the emotional climate degenerating. On the other hand, an upset termination was coded when play ended as a result of deteriorating emotions.

Emotions. The children were coded every ten seconds during play episodes for three emotions: pleasure, fear and anger. The level of pleasure and excitement was inferred from smiles and laughter, verbalizations of pleasure (e.g. "More!") and high-pitched squeals. The level of fear was inferred from facial indicators (e.g. wide eyes, frowning) and verbalizations of discomfort (e.g. "Stop!" said in a distressed tone of voice; halting or gasping sobs). The level of anger was inferred from facial expressions (e.g. clenched teeth, curled lips, narrowed eyes), aggressive verbalizations (e.g. insults or threats), growls and cries of frustration. The coding values used were 0, 2 or 4. The absence of a score for an episode was treated as a missing value. Inter-rater agreement (Kappa) for emotions coded during rough-and-tumble play was 0.71 for pleasure; 0.69 for fear and 0.70 for anger. The average scores for emotions during rough-and-tumble play were 2.3 for pleasure ($SD=0.7$), 1.1 for anger ($SD=0.8$), and 0.7 for fear ($SD=0.6$).

Rough-and-tumble play factors used in analysis. From the preceding behavioural codes, five variables were calculated: the frequency of fathers' regulations, and four dyadic balance variables, which were calculated by subtracting child scores from the father scores. The dyadic balance variables were (1) the dyadic balance of suggestive initiations and changes; (2) the dyadic balance of directive initiations and changes; (3) the dyadic balance of negative reactions and upset terminations; and (4) the dyadic balance of positive reactions. For the dyadic balance variables, a higher positive score indicates that it is the father who is more often demonstrating the particular behaviour. A factor analysis with Varimax rotation was then performed to combine and further reduce all the rough-and-tumble play items. The factor analysis included the five derived observation variables, three observed child emotion scores (pleasure, fear, and anger), and parent-reported rough-and-tumble play frequency and rough-and-tumble play duration.

The analysis revealed four factors explaining 66.8% of the total variance. The first factor, *mutual influence* (19.4%), consisted of a positive score in the dyadic balance of suggestive initiations and changes, and a positive score in the dyadic balance of directive initiations and changes, that is, fathers demonstrated these behaviours more often. The second factor, *quantitative score* (16.1%), consisted of a low score of child pleasure and elevated scores of frequency and duration of the play. The third factor, *negative fearful reaction* (16.0%), consisted of a positive score in the dyadic balance of negative reactions and upset terminations (i.e., more father negative reactions) with an elevated child fear score and a low child anger score. The fourth factor, *dyadic regulation* (15.3%), consisted of a negative score in the dyadic balance of positive reactions (i.e., more child positive reactions) and an elevated score of father regulations. The four factors were not significantly correlated to each other. The average score of factor 2, *quantitative score*, was significantly higher for boys than girls ($t=2.96, p=.004$), meaning more RTP but less pleasure among boys than girls, while the average score of factor 3, *negative fearful reaction*, was significantly higher for girls than for boys ($t=-2.17, p=.032$), meaning more negative reactions of fathers towards girls than towards boys, and more upset terminations and fear, and less anger, in girls compared to boys.

Child Social Adaptation (T1)

The Social Behaviour Questionnaire (SBQ; Tremblay, et al., 1991) was used to evaluate the child's social adaptation at time 1, as rated by the father. For each behaviour (for example, "Will try to help someone who has been hurt"), the father indicated whether the child exhibits the behaviour (3) Frequently, (2) Occasionally, or (1) Never. An externalising behaviour score was created by summing the physical aggression and hyperactivity scales, and an internalising behaviour score by summing the insecurity and anxiety scales. In the sample, Cronbach's alphas were respectively 0.85, 0.67, and 0.83 for externalising behaviours (20 items), internalising behaviours (11 items), and prosocial behaviours (5 items).

Externalising and Internalising Behaviours (T2)

The Teacher Report Form (TRF) for Ages 6–18 (Achenbach & Rescorla, 2000) was used at time 2 to evaluate the school-age children's externalising behaviours (58 items; Cronbach's $\alpha=0.96$) and internalising (33 items; Cronbach's $\alpha=0.84$). The externalising behaviour scale was comprised of the syndrome scales of Attention Problems, Hyperactivity /Impulsivity, Rule-Breaking, and Aggressive Behaviour. The internalising behaviour scale included

Table 1 Correlations between the dependent variables (T2) constituting School Adjustment, according to the child's sex

| Girls | Boys | | | |
|----------------------|--------------------|---------------|-----------|----------------------|
| | Externalising | Internalising | Prosocial | Academic achievement |
| Externalising | | 0.45** | −0.39* | −0.30 [†] |
| Internalising | 0.49*** | | −0.35* | −0.26 |
| Prosocial | −0.50*** | −0.36* | | 0.58*** |
| Academic achievement | −0.27 [†] | −0.09 | 0.04 | |

[†] $p < .07$ * $p < .05$ ** $p < .01$ *** $p < .001$

Anxious/Depressed, Withdrawn/Depressed and Somatic Complaints.

Prosocial Behaviour (T2)

As at time 1, the Social Behaviour Questionnaire (SBQ, Tremblay et al., 1991) was used at time 2 by teachers to evaluate the prosocial behaviour of school children (9 items; Cronbach's alpha = 0.93).

Concerning the measures of social adaptation, the mean score of boys' externalising behaviours (on the TRF) was higher than girls ($t = 2.20$, $p < .05$), while girls' mean score on prosocial behaviours (on the SBQ) was higher than boys ($t = -2.40$, $p < .05$). Table 1 shows that the associations between these three socio-emotional variables (internalising, externalising and prosocial) is the same in boys as in girls, as seen generally in the literature. That is, externalising and internalising behaviours were positively correlated, while both these behaviours were negatively correlated with prosocial behaviour.

Academic achievement (T2)

The Teacher Rating Scale (TRS, Hammes et al., 2016) was used to evaluate the academic achievement of the children in time 2. Teachers answered four items about the children's reading, writing, mathematics and global performance in comparison to other children on a 5-point rating scale (1 = Well below average to 5 = Well above average). The items were aggregated to create one 'academic achievement' score (Cronbach's alpha = 0.94). The mean score on academic achievement was not significantly different between girls and boys ($p > .05$). Since the components of school adjustment were not consistently intercorrelated (see Table 1), they are treated separately in the analysis.

Family involvement questionnaire (T2)

To assess the involvement of both parents in their children's educational experiences, the father completed the Family Involvement Questionnaire (FIQ, Fantuzzo et al., 2000). For each item, the father indicated whether he does this activity or not (Yes or No), and also whether the mother

does this activity or not. Three scales are generated from the questionnaire. The Home-Based Involvement scale (14 items) concerns behaviours reflecting active promotion of a learning environment at home for children. The School-Based Involvement scale (10 items) is defined by activities and behaviours that parents engage in at school to benefit their children. The Home-School scale (11 items) concerns communication behaviours between parents and school personnel about a child's educational experiences and progress. In the sample, Cronbach's alphas were respectively 0.68, 0.76, and 0.89 for fathers, and 0.43, 0.74, and 0.61 for father-report of mother school involvement.

The three paternal scales were all strongly correlated (r between 0.46 and 0.58; $p < .001$). The average scores of the three paternal scales were not significantly different between girls and boys. The scores of the fathers and mothers (father-reported) were significantly and positively correlated ($p < .01$), but paired t-tests showed that fathers reported mothers as more involved than themselves ($p < .001$).

Results

Missing data within the questionnaires were replaced by scale means. All variables were normally distributed, with no outliers. Analyses were completed separately for boys and girls in light of the significant differences found in earlier studies, that is, boys demonstrate more rough-and-tumble play and in the dependent variables in earlier studies, that is, boys demonstrate more rough-and-tumble play and externalising behaviours, and girls demonstrate more internalising behaviours, prosocial behaviours and higher academic achievement.

Correlations

Correlations were calculated between children's school adjustment at time 2 (social adaptation [internalising, externalising, and prosocial]; and academic achievement) and father rough-and-tumble play at time 1, and his school involvement at time 2. Table 2 shows three significant correlations between the variables for boys. Boys' externalising behaviour is correlated with RTP factor 1, *mutual influence*. The negative correlation ($r = -.32$) signifies that boys have

Table 2 Correlations between variables for boys and girls

| | Internalising T2 | | Externalising T2 | | Prosocial | | Academic | |
|--|------------------|--------|------------------|-------|-----------|-------|----------|--------|
| | Boys | Girls | Boys | Girls | Boys | Girls | Boys | Girls |
| RTP Factor 1 mutual influence | -0.05 | -0.08 | -0.32* | -0.14 | -0.17 | 0.13 | 0.05 | 0.02 |
| RTP Factor 2 quantitative score | -0.11 | -0.07 | 0.01 | 0.30† | 0.18 | -0.02 | -0.04 | -0.30 |
| RTP Factor 3 negative fearful reaction | 0.02 | 0.01 | 0.18 | 0.04 | -0.04 | 0.13 | -0.42** | -0.14 |
| RTP Factor 4 dyadic regulation | -0.11 | -0.08 | -0.15 | 0.31† | -0.25 | -0.05 | -0.07 | -0.40* |
| Home-School | -0.08 | -0.20 | -0.10 | 0.17 | 0.21 | -0.07 | 0.28 | -0.22 |
| Home-Based | 0.11 | -0.33* | -0.20 | -0.06 | 0.21 | 0.03 | 0.20 | -0.25 |
| School-Based | -0.02 | -0.16 | -0.28 | 0.09 | 0.34* | 0.01 | 0.13 | -0.11 |

† p < .10 * p < .05 ** p < .01

Table 3 Multiple regressions on externalising and prosocial behaviours in boys in T2 controlling respectively for externalising and social competence in T1

| | Variables | R ² | F change | β | t | p |
|--------|---------------------|----------------|----------|-------|-------|-------|
| Step 1 | | 0.03 | 2.13 | | | |
| | Externalising T1 | | | 0.23 | 1.46 | 0.153 |
| Step 2 | | 0.13 | 3.87* | | | |
| | Externalising T1 | | | 0.27 | 1.79 | 0.082 |
| | Factor1 | | | -0.35 | -2.32 | 0.026 |
| Step 1 | | 0.15 | 3.41* | | | |
| | Social competence | | | 0.02 | 0.10 | 0.919 |
| | School-Based Mother | | | 0.46 | 2.50 | 0.020 |
| Step 2 | | 0.30 | 4.84** | | | |
| | Social competence | | | 0.04 | 0.23 | 0.822 |
| | School-Based Mother | | | 0.13 | 0.63 | 0.533 |
| | School-Based Father | | | 0.51 | 2.50 | 0.020 |

*p < .05 ** p < .01

more externalising problems at school when during rough-and-tumble in the preschool years, fathers let their sons direct the course of the play. Boys’ prosocial behaviour is correlated with fathers’ involvement at school (time 2). The positive correlation ($r = .34$) signifies that boys have higher prosocial behaviours when their father (concurrently) participates frequently in school activities. Boys’ academic achievement is correlated with the RTP factor 3, *negative fearful reaction*. The negative correlation ($r = -.42$) signifies that boys’ academic achievement at school is weaker when as preschoolers they manifest frequent negative reactions, such as anger, towards their father during rough-and-tumble play.

Table 2 shows there are two significant correlations between the variables for girls. Girls’ internalising behaviour is correlated only with father home-based school involvement. The negative correlation ($r = -.33$) signifies that girls have fewer internalising problems at school when their fathers are (concurrently) more involved in academic activities in the home. Girls’ externalising behaviour at school trends towards significant positive correlations with RTP play factor 2, *quantitative score*, and RTP factor 4, *dyadic regulation*. This may suggest that girls have more externalising behaviours when there is more father-child rough-and-tumble play with less pleasure, and when fathers

are more regulating and make fewer positive reactions to their daughter. Girls’ academic achievement is correlated only with RTP play factor 4, *dyadic regulation*. The negative correlation ($r = -.40$) signifies that girls’ achievement is weaker when during rough-and-tumble play in the preschool years, fathers make many regulations (rules) and few positive reactions to their daughters.

Regressions

Hierarchical regression analyses were conducted to verify whether rough-and-tumble play predicted school adjustment in T2 when controlling variables in T1. Table 3 shows that the beta coefficient between boys’ externalising behaviour at school and RTP factor 1, *mutual influence*, remained significant even after controlling for their externalising behaviour in the preschool years. Externalising behaviours (time 1) and RTP factor 1 together explained 13% of the variance in boys’ externalising behaviour at school; thus, 10% of the variance can be attributed to the RTP factor. This result confirms that boys have more externalising problems at school when during rough-and-tumble in the preschool years, fathers let their sons direct the course of the play.

Table 3 shows that the correlation between boys’ prosocial behaviours at school and fathers’ concurrent school-based

Table 4 Multiple regression on internalising behaviours in girls in T2

| | Variables | R ² | F change | β | t | p |
|--------|-------------------|----------------|----------|---------|-------|-------|
| Step 1 | Internalising T1 | 0.05 | 0.01 | 0.02 | 0.15 | 0.878 |
| | Home-Based Mother | | | 0.01 | 0.08 | 0.940 |
| Step 2 | Internalising T1 | 0.06 | 1.87 | −0.11 | −0.66 | 0.512 |
| | Home-Based Mother | | | 0.06 | 0.37 | 0.716 |
| | Home-Based Father | | | −0.38 | −2.36 | 0.023 |

involvement remained significant even after controlling for their social competence in preschool and mother's concurrent school-based involvement. The three variables explain 30% of the variance in boys' prosocial behaviours; thus, 15% of the variance can be attributed to father's school-based involvement. This result confirms that boys have higher prosocial behaviours when their father participates frequently in school activities.

Table 4 shows that the correlation between girls' internalising behaviours at school and fathers' concurrent home-based involvement remained significant even after controlling for girls' internalising behaviours in the preschool years and mothers' home-based involvement. However, the explained variance is low (< 2%) and the regression model is not significant.

Discussion

The aim of this study was to describe and explain how children's school adjustment at age 8 years was associated to two aspects of father involvement. The most important result of this study is that father-child rough-and-tumble play at age 4 is associated, four years later in primary school, with both social adaptation and academic achievement of boys, and only with academic achievement of girls. This result confirms the hypothesis that rough-and-tumble play is a more important socialisation mechanism among boys (Paquette et al., 2020). In fact, fathers generally do rough-and-tumble play with their sons more often than with their daughters (Paquette et al., 2003; Flanders et al., 2009), and both biology and socialisation are likely to predispose boys to competitive physical play (Friedman & Downey, 2014).

Rough-and-tumble play and social adaptation

In this study, boys demonstrated more externalising behaviours at school when during rough-and-tumble play with father in the preschool years, their fathers let them direct the play. Even after having statistically controlled the externalising behaviours at time 1, the father-son rough-and-tumble play explained 10% of the variance of boys' externalising behaviours. This result confirms the important role of

paternal control within rough-and-tumble play in teaching boys to regulate their emotions and thus avoid developing externalising behaviours, especially since it is mainly boys who normally develop problematic levels of externalising behaviours (Fernandez Castela & Kröner-Herwig, 2014). This also shows the importance of observational studies rather than self-reported questionnaires which showed that mothers as compared to fathers are perceived as more supportive and more behaviourally controlling (Yaffe, 2020). Observational studies have shown that the dominance relationship during rough-and-tumble play is an important indicator of quality for predicting aggressive behaviour (Anderson et al., 2017; Flanders et al., 2009, 2010). When the father exerts more dominance over his child within the play, the frequency of preschool rough-and-tumble play is negatively associated with physical aggression and emotion regulation problems five years later (Flanders et al., 2010). In other words, when the father exercises limits and control during frequent bouts of rough-and-tumble play over time, children are less likely to be physically aggressive with peers. On the other hand, excessive paternal control in rough-and-tumble play may promote the development of externalising behaviours in boys (van Heel et al., 2019). Relatedly, paternal hostility has been found to have a greater effect than maternal hostility on child aggression, especially in boys (Chang et al., 2003). This is why the dyadic balance within rough-and-tumble play is so important to positive child outcomes.

It should be noted, however, that two out of four rough-and-tumble play factors were close to being significantly associated with girls' externalising behaviours. Girls seemed to show more externalising behaviours when there was a lot of preschool rough-and-tumble play with their father or when these games were characterized by a lot of rules and little positive feedback from the father (factors 2 and 4). Thus, although preschool rough-and-tumble play with the father may be a socialization mechanism for girls, it could be suggested that girls are vulnerable to negative experiences within this type of play.

The absence of a link between father-child rough-and-tumble play and children's prosocial and internalising behaviours in this study is not surprising because rough-and-tumble play is theoretically seen as a possible mechanism

for regulating aggression and the development of competition skills in children (Paquette, 2004). In fact, research to date has found significant associations of rough-and-tumble play with emotion regulation, including externalising behaviours, and none with prosocial and internalising behaviours (Fletcher et al., 2013; Paquette et al., 2020). Externalising behaviour is a form of behaviour that encompasses physical aggression, defiance, angry outbursts, hyperactivity and inattention, behaviours that may involve risk-taking. In this sense, rough-and-tumble play may teach a child what not to do, in other words, how to control his aggression or defiance, rather than what to do, as in how to share with or help another, that is, prosociality.

Rough-and-tumble play and academic achievement

Another important finding is that father-child rough-and-tumble play in preschool was associated with children's academic achievement, as is the father's teaching interactions in the study of McKelvey et al. (2011). The results are supported by previous research that showed positive associations between rough-and-tumble play quality and children's academic skills (Anderson et al., 2019). The link between father-child play and academic achievement is further supported by research showing that the strongest predictor of academic achievement aside from SES, is children's own self-beliefs, which encompass concepts such as mental toughness, self-control, or global self-esteem (Lee & Stankov, 2018). These are the qualities that rough-and-tumble play and father-child play more generally are believed to facilitate (Paquette et al., 2003). Furthermore, there is evidence that children with warm relationships and secure attachment to fathers may experience less academic anxiety in later years. For example, adolescents with secure attachment to their father had less math anxiety than those with lower attachment scores (Demirtas & Uygun-Eryurt, 2020).

However, it is not the same rough-and-tumble play quality factors that predicted academic achievement in boys and girls. Boys performed less well academically when during rough-and-tumble play fathers demonstrated more negative reactions than the boys, the dyad demonstrated more upset terminations, and boys demonstrated more fear and less anger (factor 3). Not being sensitive to their son's signals during rough-and-tumble play and over-stimulating or over-exciting him, a father could miss opportunities to scaffold the child's self-beliefs and self-regulation. For positive benefits from rough-and-tumble play, the hierarchy of the father with respect to the boy must be coupled with mutuality: when interactions are two-way, long duration of rough-and-tumble play is associated with greater social competence and less aggression in the boy (Dubé, 2011). In other words,

to enable reciprocity between the play partners, the hierarchy must not be too pronounced.

Girls performed less well academically when father made more rules and less positive reactions towards them during RTP. This result is supported by evidence that girls react negatively (e.g., more anxiety, more disconnection) to paternal hostility or over-control (Creveling-Benefield & Varela, 2019; Macdonald et al., 2018) and need positive feedback from the father in order to develop positive self-esteem themselves (Bureau et al., 2020).

School involvement and social adaptation

Regarding the second element of father involvement, father participation in schooling activities, the results show that fathers' involvement was significantly associated with two dimensions of children's social adaptation but was not associated with academic achievement.

Boys were more prosocial at school when their fathers were more involved in school-based activities. These associations explain 15% of the variance and remained significant even after controlling for mother's school-based activities and prosocial behaviours at time 1. This connection is supported by evidence that fathers' schooling involvement is especially important for boys compared to girls (Marcon, 1999). Fathers' participation in school-based activities, such as planning outings or events, can be seen as an extension of his responsibility as a parent (Kim & Hill, 2015), and such civic-minded behaviour may model prosociality for his son (Kelly, 2018).

Girls demonstrated fewer internalising behaviours at school when their fathers were more involved in home-based learning activities. However, after controlling for mother's home-based activities and internalising behaviours at time 1, the father's home-based activities explain only 1% of the variance in girls' internalising behaviours. The trend, however, is in-line with previous research using the same instrument (e.g., Fantuzzo et al., 2000), and fits with the broader view that positive father involvement is linked to fewer psychological problems in girls (Sarkadi et al., 2008).

School involvement and academic achievement

The finding that no aspect of fathers' schooling involvement was linked to children's academic achievement goes somewhat against the robust evidence for positive effects from parents' involvement. Castro et al. (2015) for example, demonstrated through a meta-analysis of 37 studies involving more than 80,000 families, that parental involvement has a positive and moderate impact on academic achievement, although in that corpus of research, there was no disaggregation of parent gender. Other studies that purposively

sample father involvement in schooling find positive links between involvement and achievement (e.g. Baker, 2018; Rollè et al., 2019) as well as negative (McBride et al., 2009).

Strengths and Limitations

One limitation of this current study is the sample size. With a larger and representative sample size, and based on findings of correlations nearing the significance value of $p < .05$, it could be expected to find larger, significant negative associations between boys' and girls' externalising behaviours and academic achievement, as well as positive associations between two of the four RTP factors and girls' externalising behaviours. It is also important to determine if the results would be the same with a measure of academic achievement based on scholastic grades, rather than on teachers' judgement of academic achievement. The main strength of the study lies in the use of observational data to evaluate the quality of interactions between fathers and their preschool age children. This approach allows us to demonstrate an important contribution of fathers to their children's school adjustment.

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Data availability The datasets generated during and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

Ethical statement The project has received the ethical approval of the CERFAS (Comité d'éthique de la recherche de la Faculté des Arts et des Sciences) of the Université de Montréal.

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