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Play fighting (rough-and-tumble play) in children: developmental and evolutionary perspectives

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ABSTRACT

Play fighting and chasing in human children – often referred to as rough-and-tumble play, or RTP or R&T – is a common form of play, and one that has the most obvious correspondence to play in many (especially mammalian) non-human species. Unlike object, pretend and sociodramatic play, generally encouraged by teachers and parents, play fighting is viewed in a much more ambivalent way. The role it has in development, and whether this should be viewed in a positive or negative light, continues to be debated. Here we review what insights may be gained from research on play fighting in non-human species, main developmental trends in humans, definitional and measurement issues, cultural variations, and empirical data on the correlates found with behaviors of adaptive significance. We conclude with some reflections on theoretical issues and future research priorities. A consistent theme from work with non-human species, parent–child RTP, and peer-peer RTP, is that RTP experience is important for emotional control and the learning of restraint in what may be competitive or conflictual situations.

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Play fighting and chasing, or rough and tumble play (RTP or R&T for short), is the predominant form of social play in non-human species, notably in mammals, and has been widely studied. Despite its prevalence in human children, the topic has not received as much attention from developmental psychologists as have object, pretend and sociodramatic play. Most forms of children's play are viewed very positively by early childhood educators (Smith, 2010); play fighting is viewed in a much more ambivalent way, because of the apparent similarity to real fighting. However, the majority of studies on children's play fighting suggest adaptive or beneficial outcomes. In this article we review the form, function and measurement of play fighting in human children, starting with a broader species perspective.

What insights may be gained from research on play fighting in non-human (especially mammalian) species?

There is a large body of work on play fighting in non-human species, especially in mammals where it is quite prevalent. Sex differences, favoring males, are often found

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in aspects of mammalian play such as the repertoire of play behaviors, their frequency and bout length. These have been linked to an underlying neural circuitry for play that is subject to sexual differentiation during the early (prepubertal) period of life (VanRyzin et al., 2020).

The laboratory rat has been very intensively studied, including on how the early environment and deprivation experiences can influence the development of play. Rat social play is defined as 'a combination of altered or exaggerated forms of sexual, aggressive and predatory behaviour … also termed rough-and-tumble play' (Achterberg & Vanderschuren, 2020, pp. 39–40). A review by Stark and Pellis (2020) highlights the importance of role reversal in play, where there is a balance of cooperation and competition. Deprivation of such play opportunities in the juvenile period leads to reduced impulse control as adults, such that even mild social contact can lead to aggression. Deprivation studies have some conceptual issues, as it is difficult to deprive only play (and not other social experiences): but Stark and Pellis (2020) report a study which compared individual rats reared with a same-age rat from either the same strain (that played normally), or another strain that provided social contact but showed relatively little play. As adults, the play deprived rats were more likely to escalate playful interactions into aggressive ones.

The findings regarding sex differences and effects of rearing conditions are consistent with an epigenetic model, as proposed by Sgro and Mychasiuk (2020). They regard play behavior as moderated by reward systems in the brain, with involvement of specific genes, but regulated by 'the dynamic interaction between gene expression and the environment' (p.25). In rats, besides peer play experience, maternal care and maternal-offspring interactions have been implicated as important environmental influences, with stronger effects for male than female juveniles.

Research with rats but also other mammalian species, has suggested that the prevalence of play fighting, its epigenetic basis, its design features (its similarity to real fighting but in a safe context), and the costs involved in playing (in time, energy, possible dangers or accidental injury) imply some adaptive benefits, albeit variable depending on context. Sharpe (2019) has reviewed the evidence for a range of theories regarding the specific benefits of mammalian play; these include that play develops motor skills generally, physical strength and endurance, practice of adult skills (such as predation skills in predator species), reducing actual aggression, social bonding, establishment of rank in social groups, training for the unexpected, and coping with stress. The evidence supporting these different theories is quite variable, leading Sharpe (op cit., pp.59-60) to conclude that 'it is clear that we do not have compelling evidence to support any of the hypotheses advanced to explain play's function', although some (such as coping with stress) 'definitely warrants further study' (p.59). As VanRyzin et al. (2020) argue, 'the ultimate function of the sex difference in play may be to enable appropriate expression of sex-typical adult social behaviors' (p.68). Non-human primates are our closest relatives, and according to Burghardt and Pellis (2019), 'about 50% of primate species retain play fighting as adults and use it strategically for social assessment and manipulation' (p. 25). For humans too, an extended developmental perspective can be important.

Main developmental trends in humans, including parent–child and peer-peer forms, especially definitional and measurement issues

In developmental psychology, RTP is seen as one variety of physical activity play (Pellegrini & Smith, 1998; Lindsey, 2014) and is 'characterised by aggressive behaviors such as wrestling, grappling, jumping, tumbling, and chasing, in a play context' (Flanders et al., 2009, p. 286). As such, RTP is viewed as 'rough play', alongside big body play, risky play, and pretend and fantasy forms such as war play (Hart & Tannock, 2019). The play context of RTP distinguishes it from real aggression. Some researchers distinguish contact (play fighting) and non-contact (play chasing) forms of RTP (Lindsey, 2014). Lew-Levy et al. (2020, p. 1290) categorised chasing games as exercise play, separate from their category of rough-and-tumble play. Although chasing play is a social form, exercise play generally is thought to have mainly physical fitness benefits, and with a different developmental trajectory from play fighting (Pellegrini & Smith, 1998).

Developmental trends in parent–child RTP

The precursor to true RTP in parent–child play could be considered as vigorous playful physical interaction. Parents incorporate movement and physical touch by manipulating their child's arms and legs, and by bouncing, lifting, and flying the infant through the air. This play clearly cannot incorporate competitive, cooperative or playfight elements. However, parents vary in the vigour and playfulness of these interactions. As children mature, parent–child physically active play then includes chasing, fleeing, and catching, with games of tickling, hugging, and hiding taking place in the air and on the ground (Paquette, 2007). Both mothers and fathers interact with their young children in this way, but in general, fathers spend more of their time with children in physical play than mothers, and much research focuses on father–child play.

True RTP occurs when the play between father and child incorporates elements of competition alongside cooperation. This play may start as a hug or cuddle and then develop into a bout of RTP, or it may be directly initiated by father or child in an effort to interact in a positive way. In this way, father–child RTP consists of a constellation of behaviors that together make a playful, cooperative, and competitive interaction. Actions such as tussling, grappling, and wrestling take place as partners attempt to gain the 'upper hand' in the playfight. Kicking, hitting, punching or biting are aggressive behaviors that are rarely observed in father–child RTP, as their presence would contradict the essential playfulness of the interaction. Indeed, high-quality father–child RTP demonstrates core structural features that are a unique synthesis of fundamental parenting constructs such as warmth, reciprocity, assertive control, sensitivity, touch, and playfulness (StGeorge & Freeman, 2017). The cooperative and competitive elements include balancing wins and losses for fathers and child: fathers self-handicap, so their child has a chance of winning and is physically safe. In this way, fathers provide an optimal balance of arousal and challenge. The playfulness and positive emotions that emerge during the play are indicators of a mutually enjoyable interaction (Flanders et al., 2013; Fletcher et al., 2013).

RTP occurs more frequently between fathers and sons than fathers and daughters. When mothers play RTP, they tend to do this more often with their sons (Fliek et al.,

2015), but this is not a consistent finding (Paquette et al., 2003). Some researchers note that girls enjoy RTP as much as boys, while others find that girls' RTP is less competitive and gentler in its physicality (StGeorge et al., 2018), or lower in quality (Carone et al., 2020).

The cognitions or thoughts and intentions behind RTP differ between child and adult. Children's thoughts and intentions appear to contain contrasting elements of make-believe – as if 'I can beat my Dad', and of reality, 'He is much bigger and stronger than me'. Parents' reports of their children's RTP suggests that children find this balance of reality and make-believe deeply engaging: 'Dad's fighting back so that there's that resistance but the child is feeling like he's strong, he can actually overpower Dad' (StGeorge et al., 2018, p. 1506). Some emotions experienced with the play are shared, such as mutual enjoyment and pleasure. For the child additionally there may be moments of frustration, fear or anger if their attempts to win are not successful. These emotions are generally fleeting (Paquette et al., 2003), and if not resolved, the playful interaction will end. True RTP (competition and cooperation) occurs only when children's cognition has developed enough for them to interpret their partner's emotions and behaviors. Broadly this occurs during the child's third and fourth years, which is why the prevalence and frequency of father–child RTP is seen to increase from toddler through preschool and peaking at about seven years, thereafter decreasing (MacDonald & Parke, 1986).

Adults' thoughts about RTP generally centre on intentions to create or respond to a playful interaction with their child, either for the sake of play itself, or more purposefully to connect, teach or model (StGeorge et al., 2018). Adults are generally aware that there needs to be a balance in win and lose for the child. This meta-awareness of the purpose of RTP facilitates the adult's ability to attune to their child's behaviors and emotions throughout the play.

Measurement of parent–child RTP

Studies of father–child RTP tend to focus on three measurable aspects of this play: frequency, duration, and quality (for a review see StGeorge & Freeman, 2017). The variables of frequency and duration are usually correlated, as they indicate something about the value of RTP to the dyad. The play will usually only last as long as it is enjoyable (duration and quality) and likely only to be engaged in more frequently if enjoyed (quality and frequency) (Paquette & Dumont, 2013).

The quality of the play, that is, its character, tone or modality, is of great interest to researchers and practitioners. RTP incorporates positive parenting behaviors such as warmth and reciprocity, but it also includes a paradoxical mixture of perceived frightening and sensitive behavior. Father is seen as both a challenger and a protector. The child experiences a mixture of exhilaration and fear as they face an evidently much stronger challenger who at times, they are able to win over. This specific 'scary-funny' element is typical of children's risky play (Sandseter, 2010), and also distinguishes parent–child RTP from regular physical or pretend play.

Observational measures attempt to specify the elements of RTP in order to better understand linkages of this play type to child behavior. Relevant physical and verbal behaviors include those that start, continue, or pause the game, such as initiatives and

directives (e.g. Lindsey & Mize, 2000) and other behaviors such as contingent responding, compliance or resistance, and affective behaviors such as laughing, crying or anger (Paquette et al., 2003).

Other observational measures attempt a more global assessment of the play quality, such as demonstrations of warmth, enjoyment, playfulness, and dominance. The Rough and Tumble Play Quality Scale (RTPQ, Fletcher et al., 2013) is a global rating scale that captures clusters of individual and dyadic affective states and behaviors, verbal and nonverbal. Fathers' RTP quality has been associated with his sensitivity (Carone et al., 2020), supportiveness (Anderson et al., 2019), and frequency of RTP (StGeorge et al., 2021). Only one study has compared mother and father RTP quality, finding no difference (with 8–12 year-old children) (Majdandžić et al., 2019).

An alternative to observational studies, is to measure RTP by parent-reported questionnaires. One widely used is the *Au Jeu Pere/Pere en Jeux* questionnaire (Paquette et al., 2003), which includes one question on frequency, and seven questions on quality (e.g. 'does your child get angry?'). As another example, the Parental Play and Care Questionnaire (Fliek et al., 2015) asks parents to rate the frequency of exuberant talking, laughing and behaving (e.g. 'we talk loudly and scream', 'play gets wild').

Thus, the frequency, duration and quality of RTP can be measured both as parent-reported behaviors and as observed behaviors (video-recordings). Self-report of parenting is vulnerable to over or underestimation of behaviors (Morsbach & Prinz, 2006), and coding of micro or global behaviors is time-consuming and requires training. However, studies can reduce bias and enhance validity by combining methods and assessing inter-rater reliability on researcher-observed behaviors. For example, the four studies utilising RTPQ cited above, all reported intra-class correlation coefficients (ICC .78-.96) representing good reliability of coders' agreement.

Peer-peer RTP

From the nursery school years onwards, peer-peer RTP is common and manifests in many types of play. Among kindergarteners (3-5 years) in Norway, tumbling, wrestling for superior position, fragmentary wrestling and chasing are described by Storli (2013). A similar analysis in the USA of 6–9 year olds in a youth centre described 18 kinds of RTP behaviors including tackling, chasing, fleeing, and shadow boxing (Reed & Brown, 2000). Interviewing kindergarten teachers in Greece, Koustourakis et al. (2015) elicited descriptions of 11 types of RTP, including poke and grappling, pile on, and protect-rescue games. Peer-peer RTP is especially common in more open areas and where soft surfaces are available. It is readily observed in school playgrounds, and typically peaks in frequency in the pre-adolescent years (Humphreys & Smith, 1984).

There is broad consensus on criteria that distinguish play fighting and real fighting between peers; these include positive facial and vocal expressions (play face, laughter, smile), restraint, reversal of roles, invitation as initiation, and togetherness at the end of play (Fry, 2005, p. 59; Hart & Tannock, 2019, p. 205; Smith, 2010, p. 108). By middle childhood, children can readily distinguish the two kinds of behavior, and can often verbalise these kinds of criteria used by researchers (Costabile et al., 1991).

Early work established that play fighting is generally more common in boys, with less gender difference in play chasing. Most studies continue to find this, for example Lindsey

(2014) among 4–6-year-olds in a US childcare centre, and Veiga et al. (2017) among 4–6 year olds in Portugal.

RTP is generally between friends (Humphreys & Smith, 1987), and up to adolescence, a play fight turning into a real fight is generally rare, as is injury during play fights. However, occasionally a fight develops, or someone gets hurt; Pellegrini (1994) found that this is much more likely in sociometrically 'rejected' children. Also, Pellegrini (2002) proposed a developmental change in playfighting, especially for boys. In the adolescent years, the boundary between play fighting and real fighting becomes more blurred; criteria such as restraint and role reversal become less obvious, and one adolescent may use the 'play' convention to actually demonstrate greater strength or dominance over the other. This developmental change is supported by observational studies (Neill, 1976), data on choice of play partners (Humphreys & Smith, 1987), and more ethnographic observations (Fry, 2014).

Perceptions of teachers about peer-peer RTP

Several studies have examined teachers' practices and perspectives on peer-peer RTP in order to support positive child outcomes in early years education. Often, teachers permit some elements of play and not others. For example, Greek kindergarten teachers allowed chase games while prohibiting play fighting (Koustourakis et al., 2015). Similarly, Norwegian preschool teachers restricted play fighting and chasing games more than other types of dramatic play, although these were allowed more outdoors than indoors (Storli & Sandseter, 2015, 2017).

The games that teachers permit within playgrounds are based on school policies as well as common beliefs that play fighting leads to aggression and injury and is not a legitimate play choice. However, education or experience can influence teachers' beliefs. For example, US preschool teachers cited their training as a major influence on their attitudes (to permit or prohibit) (Logue & Harvey, 2010). DiCarlo et al. (2015) found that preschool teachers with greater levels of education and experience were better able to distinguish boys' RTP from aggression.

Gender also plays a part in beliefs about play fighting. Differences between female and male early childhood educators have been noted in Canada (Bosacki et al., 2015) and in Norway (Storli & Sandseter, 2017). These studies suggest that early childhood education practitioners, often mostly female, have rather negative or at least ambivalent attitudes towards play fighting. However, these may be lessened following more training and experience, including working with male colleagues; Storli and Sandseter (2017) found that interactions with male colleagues led some female practitioners to shift their attitudes and practices to RTP in a more positive direction.. Hart and Tannock (2019) propose that such a shift in attitudes should be encouraged, given the weight of evidence that RTP is positively associated with beneficial aspects such as emotion regulation and social competence.

As a practical demonstration, Farmer et al. (2017) reported a randomised control trial in which eight New Zealand primary schools were assigned to an intervention to increase risk and challenge in the school playground, specifically more rough-and-tumble play as well as physical activities such as tree climbing; eight schools were in a no-treatment

control. Over the two-year period of the study, staff in intervention schools found the process enlightening, and a shift in attitudes occurred.

Cultural variations

The great majority of research on RTP has been carried out in western societies, notably North America, Europe, and Australasia. However, RTP has been described in a wide range of societies, including hunter-gatherer communities (Lew-Levy et al., 2020). It appears to be a cross-cultural, universal aspect of human behavior, although its prevalence can vary. Fry (2005, 2014) has argued that how warlike an adult society is, can be reflected in the extent of child and adolescent RTP. In a review, Roopnarine et al. (2019) show that father–child RTP is relatively infrequent in societies such as India, Taiwan and Thailand, compared to most western societies studied; they suggest that these more collectivist societies may put less value on parent–child RTP than individualistic societies with their emphasis on personal bonds.

Some other findings in non-western societies may contrast with those commonly reported. For example, Lew-Levy et al. (2020) reported gender differences in RTP to be relatively small amongst hunter-gatherer children (3-18 years) among the Hadza, and Ba-Yaka communities, especially in pre-adolescence. Because of the limited size of hunter-gatherer groups, children's play groups will be rather small, multi-aged and mixed gender; unlike the large same-age peer groups characteristically found in modern schools. Lew-Levy et al. (2020) found more gender segregation in play when hunter-gatherer groups were in larger compared to smaller camps. Fouts et al. (2013) compared Bofi hunter-gatherers and farmers, and found more gender segregation in play groups in the latter.

Attitudes to RTP may also be more relaxed; this was found for example by Peterson et al. (2018) in a study with indigenous Canadian communities, where hunting animals such as moose was relatively common, and salient to children.

Historical change is also important. In western societies, early studies have found that father–child physical play was more prevalent than mothers'; but some studies now find equivalent frequency (Laflamme et al., 2002) or quality (Majdandžić et al., 2019). Comparisons of how gender and parenting roles influence RTP are increasing as scientists adapt their questions about parenting to newer social expectations, such as egalitarian or same-sex parenting (Carone et al., 2020; Trifan et al., 2014).

Empirical data on the correlates found with concurrent or later behaviors of adaptive significance

There are positive links of parent–child and peer-peer RTP to concurrent or later child behaviors. The overall purpose of father–child RTP appears to be affiliative. Through shared positive affect, the play is likely to both create and sustain the bond between father and child (Paquette et al., 2021). High levels of big body contact are likely to contribute to this connection, as 'affective touch' is linked to social-emotional brain networks (Miguel et al., 2020). Parents also hold this view that RTP is primarily a relational interaction that promotes confidence and emotional expression (StGeorge et al., 2018).

The sum of studies examining the links (correlational and predictive) between parent–child RTP and child outcomes points to positive outcomes overall, with most studies focusing on social-emotional and cognitive competencies or behaviors (for a meta-analysis, see StGeorge & Freeman, 2017). That meta-analysis found a very low effect size for aggression, and weak, moderate and strong effect sizes for emotional skills, self-regulation and social competence respectively. Higher quality parental RTP, as measured by the RTPQ, has been linked with fewer externalising or aggression problems (Anderson et al., 2017, 2019; Carone et al., 2020) and better social emotional adjustment (StGeorge et al., 2021). These positive correlations with beneficial social-emotional skills strengthen confidence that RTP provides an important opportunity for learning emotional regulation that transfers to other social and emotional situations with peers and adults.

. While in some studies, RTP *is* linked to aggression, this is usually occurs when the father does not incorporate relational attunement within the play. For example, when fathers' mutuality within RTP is low, and the more children play with him, the more aggressive they seem to be at school (Dubé, 2012). Likewise, when fathers lacked paternal authority in their toddler sons' RTP, the boys later displayed more aggression at school (Flanders et al., 2010). Other mediators between RTP and child behavior include fathers' own anxiety (Fliek et al., 2015), father presence in household (Flanders et al., 2009) and child psychopathology (Flanders et al., 2010).

Research on peer-peer RTP also suggests mostly positive outcomes. Lindsey and Colwell (2013) found evidence for RTP predicting emotional expressiveness and emotion regulation in a sample of US 4–5-year-olds over a one-year longitudinal study. Lindsey (2014) found that boys who engaged in play fighting with other boys were better liked by peers, although boys who engaged in play chasing with girls were not liked by peers. Veiga et al. (2017) found a small (but not significant) positive correlation of RTP with social competence in a Portuguese study.

However, findings in relation to aggression are mixed. On the one hand, work in Italy by Carraro et al. (2014) reported that teaching of play fighting during physical education lessons for 13–14 year olds reduced self-reported aggression subsequently, compared to teaching of volleyball as a control. Carraro and Gobbi (2018) used a similar program with 9-year-old children and also found reductions in some measures of aggression. On the other hand, Veiga et al. (2022) reported a positive association of observed playground RTP with mothers' ratings of aggression in the home. Also, a study of 9–16 year olds in French middle schools by Garcia et al. (2020) found that engagement in RTP (based on a yes/no response) was associated with higher rates of conduct problems, substance use and risky behaviors. It is possible that the older boys were now using RTP as a dominance strategy, no longer play, as suggested by Pellegrini (2002).

Reflections on theoretical issues and future research priorities

As in animal studies, theoretical explanations are not definitive as to the function of human RTP, whether parent–child or peer-peer. However, there are several theories that help to explain the role of RTP in relationships, and in the child's development.

According to mismatch repair theory (Tronick & Cohn, 1989), the optimal development of the infant's mind depends on interactions with its primary caregivers. In this view, child and caregiver have inbuilt goals to communicate meaningfully with each

other. The meaningfulness is achieved through minute adjustments or adaptations to each other's behaviors or communications. This process of adaptation, over time, with sufficient instances of 'repair', builds the child's understanding of itself and others in the world. RTP, with its feigned competition, high arousal, and cooperation, provides an exemplary opportunity for mismatches and repairs.

The mutual regulation process and buffer-transducer model (Tronick, 2017) further explains how a dynamic flow of mismatches and repairs in parent–child communication shows how both are jointly making efforts to sustain the child's psychological functioning. In RTP, parent and child negotiate emotion, movement and meaning. Therefore, father–child RTP can be one mechanism that creates and sustains psychological functioning. The mutual regulation process gives the caregiver (father) the opportunity to learn how to express his own needs and understand and scaffold his child's.

Paquette's theory of activation relationship (Paquette, 2004) explains how children develop an emotional bond with a parent through that parent providing stimulation and encouragement within safe boundaries. Paquette argues that RTP interactions are an important contributor to this relationship for fathers and children. More recently, the term has been appropriated to 'activation parenting' (Feldman & Shaw, 2021), which suggests that RTP is subset of a parenting style that seeks to stimulate and encourage within safe boundaries.

Turning to peer-peer RTP, it is important to bear in mind the development changes in RTP postulated by Pellegrini (2002), especially in assessing the varied findings regarding aggression. During childhood, RTP may function as safe practice in fighting skills, and as an enjoyable activity that helps maintain friendships and develop skills of emotional control. In adolescence, however, it is hypothesised to function more to assess strength and to assert, display or maintain social dominance. The borderline between play fighting and real fighting can become blurred when dominance is involved. It can also be argued that some amount of aggressive behavior and risky behavior is adaptive for adolescents at the individual level, even if it is not beneficial for society generally (Ellis et al., 2012).

What may be important is how aggression is regulated. In an extensive review of ethnographic literature, Fry (2014) argues that there are strong parallels between adolescent RTP and adult 'contests'. In tribal societies, disputes are often settled by physical contests, where winning is important, but where there is some restraint rather than all-out intent to hurt or kill. 'Restrained aggression, whether in adult contests or in the R&T of adolescents, allows dominance to be established with substantially less risk to the participants than would result from all-out fighting' (Fry, 2014, pp. 181–182). A similar perspective can be found in a discussion by Mickelsson and Stylin (2021) of the parallels between RTP and martial arts. They argue that the emotional control and restraint found in RTP can provide an analytical orientation for practitioners of martial arts, which generally are associated with psychosocial benefits.

A theme running through the work with non-human species, parent–child RTP, and peer-peer RTP, is that RTP experience can be important for emotional control and the learning of restraint in what may be competitive or conflictual situations. This is provided by the experiences the juvenile has with parents and peers. In the human case, our cultural and historical environment adds another layer of complexity, modulating the perspectives and value we put on affiliation and aggression. Future research on

human RTP that builds on the rich findings of ethological studies may elucidate the mechanisms for this emotional control.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Peter K. Smith is Emeritus Professor of Psychology at Goldsmiths College, University of London, U.K. Recent edited volumes include (with Jaipaul Roopnarine) *The Cambridge Handbook of Play* (Cambridge University Press, 2018), (with James O'Higgins Norman) *The Wiley Blackwell Handbook of Bullying: A Comprehensive and International Review of Research and Intervention* (Wiley-Blackwell, 2021), and (with Craig Hart) *The Wiley-Blackwell Handbook of Childhood Social Development*, 3rd ed. (Wiley-Blackwell, 2022).

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