# Emotions in play: the role of physical play in children's social well-being

Rieffe, C.J.; De Sousa da Silva, B.M.; Moutinho, G.F.V.; Gibson, J.; Dukes, D.; Samson, A.C.; Walle, E.A.

No cover image available

**The Oxford Handbook of Emotional Development**

Daniel Dukes (ed.) et al.

https://doi.org/10.1093/oxfordhb/9780198855903.001.0001

**Published:** 2022 **Online ISBN:** 9780191889516 **Print ISBN:** 9780198855903

CHAPTER

# 23 Emotions in Play: The Role of Physical Play in Children's Social Well-Being

Guida Veiga, Brenda M. S. da Silva, Jenny Gibson, Carolien Rieffe

https://doi.org/10.1093/oxfordhb/9780198855903.013.28 Pages 339–C23.P116

**Published:** 13 January 2022

## Abstract

Play is an important context for children's emotional and social development. Most play research has been focused on pretend play; however, observational studies have shown that children spend a considerable amount of time engaged in physical play. Although it is thought to be important, little is known about the role of physical play in children's emotion socialization. Physical play can be categorized in two forms: exercise play and rough-and-tumble play. Both forms involve moderate to vigorous playful body activity, which is accompanied by physiological arousal. In addition, rough-and-tumble play often involves role taking, requiring children to accurately read their partners' emotional and intentional expressions, control their anger impulses, and cope with frustration. Recent research has shown that exercise play, especially when engaged with peers, is related to emotion understanding and emotion regulation; but this is less clear for rough-and-tumble play. Besides, physical play provides an important mechanism for peer interactions that is less dependent on verbal interactions, which is especially relevant for children with communication impairments, and hearing loss in particular.

**Keywords:** play, exercise play, rough-and-tumble play, emotion socialization, emotion regulation, emotion understanding, deaf, hard of hearing

**Subject:** Psychology, Developmental Psychology

**Series:** Oxford Library of Psychology

> Some things about children become so familiar to us that we lose sight of how remarkable they are —and lose sight too, of how little we understand the processes that underlie developmental achievements.
>
> Hobson, 2002, p. 5

## Introduction

CHILDREN like to play. Play provides relaxation, evokes pleasure, induces a sense of freedom, and gives children the opportunity to refine their skills without fear of failure. Play begins very early in life and has been argued to be one of the leading sources of children's development by many developmental theorists (Montessori, 1989; Piaget, 1951; Vygotsky, 1967). Children will almost automatically start playing whenever and wherever they can, and they will play whatever they want to: sometimes children run and chase each other, or construct things, or pretend to be someone else. From a social perspective, we can see children playing alone, playing with caregivers, playing cooperatively in small or larger groups, and sometimes quietly observing others at play.

Although the observation of children playing uncovers significant variation in play behaviors (see Zaharia et al., this volume), many play theories and much research have focused on pretend play (Fein, 1981; Lillard et al., 2013). Yet, what can we observe when observing a playground after the morning classes? What do children do outdoors when the sun rises after a rainy week? How do children play when in a forest or at the beach? They run, jump, chase each other, and wrestle! They laugh and speak in ways that are as powerful
p. 340 and as dynamic as their movements. Indeed, observational studies have shown ↳ that children spend a considerable amount of time engaged in physical play—such as running, catching, or wrestling—especially when outdoors (Lindsey, 2014; Veiga, de Leng, et al., 2017).

Despite its significance in children's everyday lives, physical play has been relatively neglected by most developmentalists. A recent review found that while much research has been done linking physical play to physical health outcomes, there is little research on its importance in children's emotional socialization (Gibson et al., 2017). Historically, this may be due to the influence of mind–body dualism and the subsequent separation of movement and emotion in popular conceptualization and in academic research. However, as researchers have returned to investigations of the link between physicality and emotion there is an emerging body of work that connects the physical aspects of play with children's social and emotional well-being (Gibson et al., 2011; Heravi et al., 2018; Lindsey, 2014; Pellegrini & Smith, 1998; Veiga, de Leng, et al., 2017).

This chapter provides an introduction to how different types of physical play are related to emotional development in childhood. An introduction to the body and emotions, and, to the concept of physical play, is given before moving to a discussion of the links between physical play and social-emotional well-being. The chapter then explores, in depth, the case of rough-and-tumble play, which has been proposed as a key mechanism for childhood emotional and behavioral self-regulation. Finally, the chapter considers the importance of physical play for those children who face challenges due to disability, focusing in particular on children with hearing loss. The chapter concludes with suggestions for future research in this important area.

## Body and Emotions

An emotion starts with a meaningful *situation* that captures our attention and *arouses* the body. This leads to an *appraisal*—an evaluation of the eliciting event as pleasant or unpleasant and of the capacity to cope with the situation. Along with the appraisal comes an urge to respond—an *action tendency,* which results in the actual *response*—the communication of the reaction and the behavioral intention, which will modify the situation and restart the process (Frijda, 1986; Sander et al., 2005; Scherer, 2000).

Emotions are often experienced as (more or less) notable bodily sensations (e.g., rapid heartbeat when a big dog starts barking, tension in the abdominal zone on an examination day), reflecting changes in

skeletomuscular, neuroendocrine, and autonomic nervous systems (Levenson, 2003) that prepare the individual to react quickly and adaptively in order to manage and regulate the intensity of the arousing experience. Young children need to learn to link those bodily cues to the emotion-evoking situation; for example, linking the sensation of tummy ache to anxiety about attending a new class. As children gradually come to understand that bodily sensations are part of the emotion process, they also learn to ignore them and focus on the emotion-evoking situation instead (Rieffe et al., 2008). Yet, when asked to reflect upon
p. 341 their bodily sensations ↳ retrospectively, children and adults alike can point out that they feel tension in their muscles when angry, or tension in their stomach when nervous.

The "sense of the physiological condition of the body" (Craig, 2003), also called interoception, is therefore related to the experience of emotions (Barrett et al., 2004), facilitating their understanding and regulation (Füstös et al., 2012), both in adults (e.g., Barrett et al., 2004; Füstös et al., 2012) and in children (e.g., Koch & Pollatos, 2014; Schaan et al., 2019). In fact, from an early age (at least since preschool age) children are already able to consciously experience internal bodily sensations (Füstös et al., 2012), and such capacity to perceive one's own bodily sensations (e.g., heart beats) has been related to emotion-regulation skills (Schaan et al., 2019). The importance of interoception within emotional experience sheds light on the role of physical play on children's social-emotional well-being.

## Physical Play

Defined as moderate to vigorous physical activity that takes place in a playful context, physical play involves large muscle activity and physiological arousal (e.g., racing heartbeat, rapid breathing, high muscle tone) (Pellegrini & Smith, 1998). This form of play can be categorized into two distinct subtypes: exercise play and rough-and-tumble play. Both forms of physical play represent a significant part of children's daily lives and play an important role on children's social-emotional well-being.

Exaggerated, active, and moderate to vigorous locomotor behaviors such as running, jumping, and climbing are labeled *exercise play* (Pellegrini & Smith, 1998). Exercise play begins in the first year of life, when children start mastering motor skills, and peaks around 4–5 years of age before declining in the primary-school years (Pellegrini & Smith, 1998). Although exercise play has been historically considered a masculine play type, recent research has found no gender differences in this domain (Colwell & Lindsey, 2005; Lindsey & Colwell, 2013; Veiga, de Leng, et al., 2017). Exercise play accounts for 19–40% and 14–48% of preschool girls' and boys' peer play respectively (Colwell & Lindsey, 2005; Veiga, de Leng, et al., 2017).

When these active play behaviors involve suspending reality and relate to chasing, play fighting, and wrestling, we identify them as *rough-and-tumble play* (Bjorklund, 2009). This form of physical play has a strong social component, and often involves reversing roles (win and lose, catch and be caught) and suspending reality (e.g., playing monsters, pirates, wrestling) (Pellegrini, 2009). Research has found that boys engage more in rough-and-tumble play than girls (Colwell & Lindsey, 2005; Lindsey & Colwell, 2013; Veiga, de Leng, et al., 2017). This form of physical play increases during the preschool period, peaks around the age of 6–10 years, and declines in adolescence (Bjorklund, 2009). The frequency of rough-and-tumble play seems to be highly related to the characteristics of the environment. Rough-and-tumble is the most
p. 342 prevalent form of social play in the preschool outdoor playground, accounting for 34% and 62% ↳ of preschoolers' social playtime for girls and boys respectively (Veiga, de Leng, et al., 2017). However, when observed in indoor and more structured environments, these frequencies decline to 19% and 22% respectively (Lindsey, 2014).

## Physical Play and Children's Social-Emotional Well-Being

Children are wired to move; to experience themselves and others in space and time in ways that do not have to involve words. In fact, when we observe toddlers and preschoolers playing in a park, we may see them throwing themselves to the ground, feeling their bodies in contact with the rocks, splashing their feet in puddles, and racing against each other. We hear them shouting and laughing with pleasure and joy. The large body movements in this scenario give children important sensory inputs, and stimulate their muscle and bone strength, advancing such motor skills as balance and coordination.

In early childhood, when language skills are still developing, motor competence is of particular importance for young children's engagement in peer interactions. Improved motor competence makes children more adept and attractive playmates (Pellegrini & Smith, 1998). On the contrary, poor motor competence may limit children's engagement with team physical games and interactions, and it is linked to a lower sense of physical and social competence, and increased experience of anxiety and depression (Cummins et al., 2005; Piek et al., 2008; Schoemaker & Kalverboer, 1994). Furthermore, physical activity modulates hormones, amino acids, and neurotransmitter levels (e.g., dopamine, serotonin, cortisol), stimulating positive mood states and producing a calming effect (Heijnen et al., 2016), which may support positive peer relationships. Hence, as a rich opportunity to improve motor competence and to promote positive mood states, physical play seems to contribute to children's establishment of successful peer relationships (Pellegrini & Smith, 1998).

As described previously, the physiological arousal (e.g., racing heartbeat, rapid breathing, high muscle tone) present in physical play is an important component of the emotional experience. A girl happily running away from her friend can hear her heart beating quickly; a boy walking on a narrow high wall can feel the tension in his stomach and notice his shortness of breath. Through the opportunity to perceive bodily changes associated with emotional experience, physical play constitutes an important context for children to become aware of their own and others' emotions, and to learn how to regulate them (Smith, 2010). Recent research has shown that exercise play, especially when engaged in with peers, is related to emotion understanding, emotion regulation, and social competence (Lindsey & Colwell, 2013; Veiga, de Leng, et al., 2017), but this association is less clear for rough-and-tumble play.

p. 343

## The Case of Rough-and-Tumble Play

Consider the following short play observation:

> John and Mike are two 6-year-old friends who are at the school playground. John is tall, strong, and the oldest of the class; Mike is the shortest.
>
> John suggests to Mike, "Let's play the world wrestling championship!"
>
> John starts moving his arms with combative, yet soft, flowing movements.
>
> The play fight continues with soft and balletic moves made by both children.
>
> John slowly punches Mike, who passively falls to the ground.
>
> John raises his arms shouting, "Yeah! I won the fight!"
>
> John circles around the playground shouting, "I won the fight!"
>
> John returns to Mike and tells him, "Let's go again!"

> This time it is Mike who puts John on the ground, proudly winning.
>
> They have a third bout and John "wins" again.
>
> When their teacher calls them back to class, Mike and John are holding hands and run back to the classroom together.

This short observation illustrates two friends engaged in play fighting, alternating roles, cooperation, and competition. However, no "real" fighting occurred in this scenario and, therefore, it is an excellent example of rough-and-tumble play as a privileged arena for children to practice their emotional competence.

First, rough-and-tumble play requires children to understand their own and others' emotions. As children enact vigorous, emotionally charged themes, excitement, pleasure, and sometimes frustration rise up, requiring children to be skilled at expressing their own emotions and intentions, as well as reading the affective and intentional cues from others about the play episode. Second, as children easily become aroused, they have to fine-tune their playful aggressive mode and modulate their excitement. In other words, during rough-and-tumble play interactions, children need to be skilled at regulating their intense emotions in order to sustain the vigor, excitement, and emotional intensity of this apparently violent form of play, instead of breaking down into aggression (Flanders et al., 2010; Pellegrini & Smith, 1998). This way, children learn their own and others' personal limits and abilities, and understand how their behavior affects others (Logue & Harvey, 2009). For instance, in the example observation, if John had hurt Mike, the play would have stopped, and John would learn that he had been too rough. This function of rough-and-tumble play as a form of emotional regulation may have its roots in early development, particularly in the context of father–child playful interactions. Rough-and-tumble play is considered a key context where fathers
p. 344 teach ↳ their children to regulate intense affect by intensifying the arousal of the rough interaction and subsequently decreasing it when it surpasses what children can tolerate (Paquette, 2004). For these reasons, rough-and-tumble play is argued to be the "traditional means by which most children learn to regulate physical aggression" (Tremblay, 2006, p. 485) and to foster children's social-emotional well-being. However, research shows ambiguous findings.

On the one hand, research shows that rough-and-tumble play among peers is positively associated with preschool boys' emotion-regulation skills, both concurrently and longitudinally (Lindsey & Colwell, 2013). Interestingly, such associations have not been observed for girls. Rough-and-tumble play has also been found to be associated with school-aged children's and adolescents' social competence (Pellegrini, 1988, 1994). On the other hand, other studies have found that preschoolers' rough-and-tumble play at school recess is positively related to physical aggression (Veiga et al., 2020) and to negative indicators of social competence, such as being disliked by peers (Hart et al., 1992; Ladd & Price, 1987).

Such equivocal findings could suggest that the functions of rough-and-tumble play may change across children's development (Hart et al., 1992). It is possible that such play may be too demanding for preschoolers, given that the frequency of this form of physical play peaks at an older age (Pellegrini & Smith, 1998). This explanation would fit with the extensive theoretical framework arguing that this form of play has the immediate function of practicing social-signaling skills (Bjorklund & Pellegrini, 2000). Furthermore, engaging in rough-and-tumble play requires children to accurately distinguish play from aggression, which might be extra demanding within an arousing atmosphere (Smith & Boulton, 1990). Therefore, regulating arousal during rough-and-tumble play might be especially challenging for a preschooler, who might misinterpret the situation, given that cooperative behaviors, theory of mind, and emotion-regulation capacities are only just emerging in children of this age group.

Carraro and colleagues (2014, 2018) developed a program based on rough-and-tumble play, assuming that exposing students to nonthreatening body-contact experiences within the school setting would help to reduce self-perceived aggression. School-aged children and young adolescents engaged in eight lessons,

two times a week, over 1 month (Carraro & Gobbi, 2018; Carraro et al., 2014). The program entailed a progression in terms of physical contact and opposition. For example, initial games involved brief physical contact and touch between participants, while in the final lesson, participants engaged in play fighting in pairs, pushing, pulling, chasing in pairs, or trying to pull the partner to the ground. Both studies showed that the program effectively reduced school-aged children's and adolescents' self-reported aggression (Carraro & Gobbi, 2018; Carraro et al., 2014). A similar program carried out with institutionalized school-aged children was shown to decrease internalizing symptoms (Veiga et al., 2020).

While these studies reinforce the idea that rough-and-tumble play may be beneficial for older children's
p. 345 emotional competence, the fact that these programs were carried out ↳ in a structured environment (i.e., in physical education classes, psychomotor therapy) also suggests that this form of physical play requires certain boundaries. For example, in the study that showed a positive relationship between rough-and-tumble play and preschoolers' physical aggression (Veiga, O'Connor, et al., 2020), there were only two adults supervising 100 children during recess, who had been instructed not to interfere in children's play, and to let them play freely and solve their own problems independently. Possibly, preschoolers needed a more controlled and calmer environment to take the best from rough-and-tumble play.

Research shows that qualitative aspects of father–child rough-and-tumble play, such as dominance and positive affective climate, support children's development in social and emotional domains. When we observe parent–child rough-and-tumble play interactions, we often see caregivers sensitive to their children's needs and emotional states, maintaining physical and emotional engagement and enabling a reciprocal exchange of dominance and subordination, with warm and positive affect. However, this is not always the case. Some caregivers find it difficult to contain and maintain the positive atmosphere of such intense body-play interactions, and highly aroused children come close to the point of losing control and becoming physically aggressive (Paquette, 2004). This can occur for different reasons: for example, due to overexcitement, difficulties in the caregiver's reading of their child's emotional expressions, or difficulties in managing their child's emotions. Some caregivers find it difficult to maintain arousal at an optimal level, making it more difficult for children to self-regulate.

Children need to learn to regulate their own emotions. This process takes place through emotion socialization, which is based on modeling, observing others, and talking about emotions with knowledgeable others. Therefore, if caregivers do not set limits during play, they may reduce opportunities for their children to learn "the social boundaries of their aggressive behavior," and this may inhibit emotion-regulation skills (Flanders et al., 2009, p. 287). Moreover, if caregivers respond to their children's playful yet aggressive behaviors with harsh emotional expressions, they may be teaching them to respond reciprocally to others' negative affect; that is, to respond by increasing conflict, which may in turn negatively impact their social interactions (Carson & Parke, 1996). Two factors seem to be important for caregiver–child rough-and-tumble play.

First, the caregiver should set limits on play by regulating the child's aggressive impulses. Research shows that when caregivers do not set limits or show dominance, the child can become more, rather than less, hostile (Barth & Parke, 1993; Flanders et al., 2009, 2010). In fact, caregivers should "communicate a double message to his child: 'I love you' (affective component) and 'I am stronger than you' (agonistic component)" (Paquette, 2004, p. 208). Second, the emotional atmosphere should be positive, as the display of negative affect through the course of playful interaction has been associated with more physical aggression in children (Carson & Parke, 1996; Veiga, O'Connor, et al., 2020). Caregivers should be aware that rough-and-tumble play should always involve a "laugh play face"—a warm and playful expression that is distinctly different from one adopted during fighting or aggression (Humphreys & Smith, 1987).

p. 346

# The Importance of Physical Play for Children with Disabilities: Children with Hearing Loss

As physical play does not require complex receptive or expressive communication skills, fine motor skills, or sustained attention, almost every child can engage and succeed in physical play. Many children with disabilities enjoy, and often prefer physical play (Case–Smith & Kuhaneck, 2008). Physical play involves proprioceptive and vestibular stimulation, which can support children with challenges in these domains (e.g., autism, attention deficit hyperactivity disorder, sensory integration disorder) to organize their behavior and feel calm (Baranek, 2002; Blanche & Schaaf, 2001). All these features make physical play an important context for social learning for children with disabilities.

These benefits of physical play may apply particularly to children with communication impairments, such as children with hearing loss, specific language impairments, or autism spectrum disorder. This group of children may have particular difficulties in engaging in play that involves higher levels of verbal communication (e.g., complex role play or pretense). The remainder of this chapter therefore explores how physical play could enhance social-emotional skills of children with communication impairment, using the example of children with hearing loss as an illustrative case study.

Like other children with communication impairments, children with hearing loss have reduced access to incidental learning (see Ketelaar et al., this volume). In their case, they may struggle to learn from observing or overhearing their peers' emotions and/or social behaviors in naturalistic contexts (Calderon et al., 2003; Moog et al., 2011). For these children, it might be harder to "connect the dots" of communication (i.e., facial expression, gestures, tone of voice, eye contact and other nonsymbolic actions, verbal content), which might lead to misinterpretations of the emotional exchange that is taking place. For example, some facial expressions can be misunderstood when they are not connected to the tone of voice or to the verbal information. Incidental learning is crucial for children's emotional and social development, and research has consistently shown that young children with hearing loss find it more difficult to understand others' emotions, regulate their own emotions, and communicate emotions (Ketelaar et al., 2012; Netten et al., 2017; Wiefferink et al., 2013).

As stated previously, play is a privileged arena for children's overall development. However, engaging in play can be a serious challenge for children with hearing loss. During play, linguistic competence is important for maintaining social interactions. Yet, with the extensive auditory and kinetic stimulation, the rapid development of contacts and rules that occur during play, participation becomes even more difficult (Brown et al., 2008; Rieffe et al., 2016). Perhaps not surprisingly, children with hearing loss seem to be more successful in engaging in one-to-one peer situations than in interactions involving two or more hearing
p. 347 peers (Martin et al., 2010). Furthermore, although children with ↳ hearing loss position themselves optimally for participation in the group, some research indicates that they are less well tuned in (Brown et al., 2008).

Children with hearing loss, either in mainstream education (da Silva et al., 2020) or in a special class (Mira et al., 2019), show a higher prevalence of exercise play compared to their hearing peers. Although the image of children with hearing loss running and jumping in the playground apparently contradicts the old idea that these children have motor difficulties (Hartman et al., 2011; Savelsbergh et al., 1991), recent studies have shown that, despite their possible balance deficits, children with hearing loss show a similar level of motor competence as their hearing peers (Engel–Yeger & Weissman, 2009). In fact, Higginbotham and Baker (1981) suggest that one particular form of physical play—exercise play—could help children with hearing loss to organize and maintain their play. Possibly, as pretend play relies on complex and continuous verbal interactions, exercise play could offer a less verbal alternative for children with hearing loss to more easily hang out with their peers. Exercise play offers opportunity for them to use their body and movement

to communicate, cooperate, and share the joy of playing together. Moreover, exercise play is more perceptible than pretend play, therefore readily catching children's attention and signaling what they need to do to join the peer interaction.

Imagine in a large playground, a young girl with hearing loss wandering around, observing her peers playing, and wishing to join them. From afar, she sees a small group of children using some little toys and talking. Because of her auditory impairment she is not able to quickly figure out what her peers are doing, and what they are actually playing. Are they taking part in pretend play? Are they building something? She might not feel confident enough to enter their interaction, and choose to avoid it. Next, she sees some peers throwing a ball at a wall, trying to see who can throw the highest and laughing when the ball goes away. This scenario catches her attention; she can easily understand what her peers are doing, and joins them. It seems plausible to assume that, considering the benefits of exercise play for children's emotion understanding and regulation that we have described here, this form of play, which is so readily available for joining in with, might be an important venue for the social-emotional well-being of children with hearing loss. Note that this scenario not only suits children with hearing loss, but also other children with communication impairments, for example children with a developmental language impairment. Although not all children with autism would like to join active group play, exercise play might be more easily accessible for them also, for the aforementioned reasons.

Regarding rough-and-tumble play, and based on our observations in the playground, children with communication impairments, and hearing loss in particular, are less likely to engage in play fights, preferring to chase and be chased (Vicente, 2019). Possibly, chasing gives these children with hearing loss an alternative rough interaction which only involves brief physical contact and opposition, and is therefore less demanding in terms of emotion understanding, emotion regulation, and theory of mind capacities. Nevertheless, more studies are needed to understand the importance of rough-and-tumble play for children with communication difficulties. For example, given the research showing that young children with communication impairments use less adaptive emotion-regulation strategies, it would be worthwhile
p. 348 to understand how caregivers of ↳ these children use rough-and-tumble play in caregiver–child interactions. Intervention research may lead to a better understanding of whether helping caregivers to be sensitive in understanding and regulating their children's emotions, while in rough-and-tumble play, could have a positive effect on the social well-being of children with communication difficulties.

## Summary and Outlook

To summarize, this chapter has explored how physical play is an important, yet often neglected, component of how children learn to regulate their emotions. Physical play can be used to support social and emotional skills development both in the context of interactions between peers and of caregiver–child interactions. Finally, the relevance of physical play for providing a mechanism for peer interactions that is less dependent on verbal interactions for children with communication impairments and hearing loss was explored specifically.

Given the scarcity of research on this topic, there are plenty of gaps that could be addressed. One priority is to develop reliable measurement tools and analytical methods that could be used to test various theoretical propositions regarding physical play. Advances in this area have been made by increasing use of sensor technologies that can provide physiological, social, spatial, and temporal information (Heravi et al., 2018; Moreno et al., 2019; Veiga, Ketelaar, et al., 2017). Secondly, as most research to date has been carried out in Western contexts, and playful interactions and emotion appraisal/expression are known to vary by culture (e.g., Rao & Gibson, 2018), we recommend that more research be done across a range of countries and cultural contexts. Finally, given the promising data on physical play supporting inclusion, we hope that this

chapter will inspire more research into how physical play interventions can support children with communication difficulties.

## Acknowledgment

Chapter opening quote reproduced from Peter Hobson, *The cradle of thought: Exploring the origins of thinking*, p. 5, Copyright © 2002, Pan MacMillan, with permission.

# References


Baranek, G. T. (2002). Efficacy of sensory and motor interventions for children with autism. *Journal of Autism and Developmental Disorders,* 12(397–421). https://doi.org/10.1023/A:1020541906063
Google Scholar WorldCat

p. 349 Barrett, L. F., Quigley, K. S., Bliss–Moreau, E., & Aronson, K. R. (2004). Interoceptive sensitivity and self-reports of emotional experience. *Journal of Personality and Social Psychology,* 87(5), 684–697. https://doi.org/10.1037/0022-3514.87.5.684
Google Scholar WorldCat

Barth, J. M., & Parke, R. D. (1993). Parent–child relationship influences on children's transition to school. *Merrill–Palmer Quarterly*, *39*(2), 173–195.
Google Scholar WorldCat

Bjorklund, D. F. (2009). *Why youth is not wasted on the young: Immaturity in human development*. Blackwell Publishing.
Google Scholar Google Preview WorldCat COPAC

Bjorklund, D. F., & Pellegrini, A. D. (2000). Child development and evolutionary psychology. *Child Development*, 71(6), 1687–1708. https://doi.org/10.1111/1467-8624.00258
Google Scholar WorldCat

Blanche, E., & Schaaf, R. (2001). Proprioception: A cornerstone of sensory integrative intervention. In S. S. Roley, E. Blanche, & R. C. Schaaf (Eds.), *Understanding the nature of sensory integration with diverse populations* (pp. 109–124). Therapy Skill Builders.
Google Scholar Google Preview WorldCat COPAC

Brown, P. M., Bortoli, A., Remine, M. D., & Othman, B. (2008). Social engagement, attention and competence of preschoolers with hearing loss. *Journal of Research in Special Educational Needs,* 8(1), 19–26. https://doi.org/10.1111/j.1471-3802.2008.00098.x
Google Scholar WorldCat

Calderon, R., Greenberg, M., Marschark, M., & Spencer, P. (2003). Social and emotional development of deaf children: Family, school, and program effects. In *Oxford hanbook of deaf studies, language, and education* (pp. 177–189). New York Oxford University Press.
Google Scholar Google Preview WorldCat COPAC

Carraro, A., & Gobbi, E. (2018). Play fighting to cope with children's aggression: A study in primary school. *Journal of Physical Education and Sport,* 18(3), 1455–1458. https://doi.org/10.7752/jpes.2018.03215
Google Scholar WorldCat

Carraro, A., Gobbi, E., & Moè, A. (2014). Brief report: Play fighting to curb self-reported aggression in young adolescents. *Journal of Adolescence,* 37(8), 1303–1307. https://doi.org/10.1016/j.adolescence.2014.09.009
Google Scholar WorldCat

Carson, J. L., & Parke, R. D. (1996). Reciprocal negative affect in parent–child interactions and children's peer competency. *Child Development*, 67(5), 2217–2226. https://doi.org/10.1111/j.1467-8624.1996.tb01853.x
Google Scholar WorldCat

Case–Smith, J., & Kuhaneck, H. M. (2008). Play preferences of typically developing children and children with developmental delays between ages 3 and 7 years. *OTJR: Occupation, Participation and Health,* 28(1), 19–29.
Google Scholar WorldCat

Colwell, M. J., & Lindsey, E. W. (2005). Preschool children's pretend and physical play and sex of play partner: Connections to peer competence. *Sex Roles,* 52(7–8), 497–509. https://doi.org/10.1007/s11199-005-3716-8
Google Scholar WorldCat

Craig, A. D. (2003). Interoception: The sense of the physiological condition of the body. *Current Opinion in Neurobiology,* 13(4), 500–505. https://doi.org/10.1016/S0959-4388(03)00090-4
Google Scholar WorldCat

Cummins, A., Piek, J. P., & Dyck, M. J. (2005). Motor coordination, empathy, and social behaviour in school-aged children. *Developmental Medicine and Child Neurology,* 47(7), 437–442. https://doi.org/10.1111/j.1469-8749.2005.tb01168.x
Google Scholar WorldCat

da Silva, B. M. S., Vicente, A., Rieffe, C., Frijns, J., & Veiga, G. (2020). Play behaviors of preschoolers with hearing loss in mainstream education. In R. Mendes, M. J. Coelho, & E. Sá (Eds.), *Estudos de Desenvolvimento Motor da Criança XIII* (pp. 192–194). Universidade de Coimbra.
Google Scholar Google Preview WorldCat COPAC

Engel–Yeger, B., & Weissman, D. (2009). A comparison of motor abilities and perceived self-efficacy between children with hearing impairments and normal hearing children. *Disability and Rehabilitation,* 31(5), 352–358. https://doi.org/10.1080/09638280801896548
Google Scholar WorldCat

Fein, G. G. (1981). Pretend play in childhood: An integrative review. *Child Development*, *52*(4), 1095–1118.
WorldCat



Flanders, J. L., Leo, V., Paquette, D., Pihl, R. O., & Séguin, J. R. (2009). Rough-and-tumble play and the regulation of aggression: An observational study of father–child play dyads. *Aggressive Behavior,* 35(4), 285–295.
Google Scholar WorldCat

Flanders, J. L., Simard, M., Paquette, D., Parent, S., Vitaro, F., Pihl, R. O., & Séguin, J. R. (2010). Rough-and-tumble play and the development of physical aggression and emotion regulation: A five-year follow-up study. *Journal of Family Violence,* 25(4), 357–367.
Google Scholar WorldCat

Frijda, N. (1986). *The emotions*. Cambridge University Press.
Google Scholar Google Preview WorldCat COPAC

Füstös, J., Gramann, K., Herbert, B. M., & Pollatos, O. (2012). On the embodiment of emotion regulation: Interoceptive awareness facilitates reappraisal. *Social, Cognitive and Affective Neuroscience,* 8(8), 911–917. https://doi.org/10.1093/scan/nss089
Google Scholar WorldCat

Gibson, J. L., Cornell, M., & Gill, T. (2017). A systematic review of research into the impact of loose parts play on children's cognitive, social and emotional development. *School Mental Health,* 9(4), 295–309. https://doi.org/10.1007/s12310-017-9220-9
Google Scholar WorldCat

Gibson, J. L., Hussain, J., Holsgrove, S., Adams, C., & Green, J. (2011). Quantifying peer interactions for research and clinical use: The Manchester Inventory for Playground Observation. *Research in Developmental Disabilities,* 32(6), 2458–2466. https://doi.org/10.1016/j.ridd.2011.07.014
Google Scholar WorldCat

Hart, C. H., DeWolf, D. M., & Burts, D. C. (1992). Linkages among preschoolers' playground behavior, outcome expectations, and parental disciplinary strategies. *Early Education and Development,* 3(4), 265–283.
Google Scholar WorldCat

Hartman, E., Houwen, S., & Visscher, C. (2011). Motor skill performance and sports participation in deaf elementary school children. *Adapted Physical Activity Quarterly,* 28(2), 132–145. https://doi.org/10.1123/apaq.28.2.132
Google Scholar WorldCat

Heijnen, S., Hommel, B., Kibele, A., & Colzato, L. S. (2016). Neuromodulation of aerobic exercise—a review. *Frontiers in*

*Psychology*, *6*, 1890. https://doi.org/10.3389/fpsyg.2015.01890
Google Scholar WorldCat

Heravi, B. M., Gibson, J. L., Hailes, S., & Skuse, D. (2018). Playground social interaction analysis using bespoke wearable sensors for tracking and motion capture. *Proceedings of the 5th International Conference on Movement and Computing*, Article 21, 1–8.
Google Scholar WorldCat

Higginbotham, D. J., & Baker, B. M. (1981). Social participation and cognitive play differences in hearing-impaired and normally hearing preschoolers. *Volta Review*, 83, 135–149.
Google Scholar WorldCat

Hobson, P. (2002). *The cradle of thought: Exploring the origins of thinking*. MacMillan.
Google Scholar Google Preview WorldCat COPAC

Humphreys, A. P., & Smith, P. K. (1987). Rough and tumble, friendship, and dominance in schoolchildren: Evidence for continuity and change with age. *Child Development,* 58(1), 201–212. https://doi.org/10.2307/1130302
Google Scholar WorldCat

Ketelaar, L., Rieffe, C., Wiefferink, C. H., & Frijns, J. H. M. (2012). Does hearing lead to understanding? Theory of mind in toddlers and preschoolers with cochlear implants. *Journal of Pediatric Psychology,* 37(9), 1041–1050.
https://doi.org/10.1093/jpepsy/jss086
Google Scholar WorldCat

Koch, A., & Pollatos, O. (2014). Interoceptive sensitivity, body weight and eating behavior in children: A prospective study. *Frontiers in Psychology,* 5, 1003. https://doi.org/10.3389/fpsyg.2014.01003
Google Scholar WorldCat

Ladd, G. W., & Price, J. M. (1987). Predicting children's social and school adjustment following the transition from preschool to kindergarten. *Child Development,* 58, 1168–1189. https://doi.org/10.1111/j.1467-8624.1987.tb01450.x
Google Scholar WorldCat

Levenson, R. W. (2003). Blood, sweat, and fears: The autonomic architecture of emotion. *Annals of the New York Academy of Sciences,* 1000(1), 348–366. https://doi.org/10.1196/annals.1280.016
Google Scholar WorldCat



Lillard, A. S., Lerner, M. D., Hopkins, E. J., Dore, R. A., Smith, E. D., & Palmquist, C. M. (2013). The impact of pretend play on children's development: A review of the evidence. *Psychology Bulletin,* 139(1), 1–34.
Google Scholar WorldCat

Lindsey, E. W. (2014). Physical activity play and preschool children's peer acceptance: Distinctions between rough-and-tumble and exercise play. *Early Education and Development,* 25(3), 277–294. https://doi.org/10.1080/10409289.2014.890854
Google Scholar WorldCat

Lindsey, E. W., & Colwell, M. J. (2013). Pretend and physical play: Links to preschoolers' affective social competence. *Merrill–Palmer Quarterly,* 59(3), 330–360. https://doi.org/10.1353/mpq.2013.0015
Google Scholar WorldCat

Logue, M. E., & Harvey, H. (2009). Preschool teachers' views of active play. *Journal of Research in Childhood Education,* 24(1), 32–49.
Google Scholar WorldCat

Martin, D., Bat–Chava, Y., Lalwani, A., & Waltzman, S. B. (2010). Peer relationships of deaf children with cochlear implants: Predictors of peer entry and peer interaction success. *Journal of Deaf Studies and Deaf Education*, *16*(1), 108–120.
https://doi.org/10.1093/deafed/enq037
Google Scholar WorldCat

Mira, C., Veiga, G., da Silva, B. M. S., & Pereira, C. (2019). As crianças com perdas auditivas nas escolas de referência para a educação bilingue de alunos surdos: uma análise dos comportamentos de jogo. In K. O'Hara & B. Travassos (Eds.), *Estudos em desenvolvimento motor da criança XIV*. Universidade da Beira Interior.
Google Scholar Google Preview WorldCat COPAC

Montessori, M. (1989). *The child, society, and the world: Unpublished speeches and writings* (Vol. 7). Clio.
Google Scholar Google Preview WorldCat COPAC

Moog, J. S., Geers, A. E., Gustus, C. H., & Brenner, C. A. (2011). Psychosocial adjustment in adolescents who have used cochlear implants since preschool. *Ear and Hearing*, *32*(1 Suppl), 75S–83S. https://doi.org/10.1097/AUD.0b013e3182014c76
Google Scholar WorldCat

Moreno, A., Poppe, R., Gibson, J. L., & Heylen, D. (2019). Automated and unobtrusive measurement of physical activity in an interactive playground. *International Journal of Human–Computer Studies,* 129, 55–63.
https://doi.org/10.1016/j.ijhcs.2019.03.010
Google Scholar WorldCat

Netten, A. P., Rieffe, C., Soede, W., Dirks, E., Korver, A. M., Konings, S., Briaire, J. J., Oudesluys–Murphy, A. M., Dekker, F. W., Frijns, J. H. M., on behalf of the DECIBEL Collaborative Study Group. (2017). Can you hear what I think? Theory of mind in young children with moderate hearing loss. *Ear and Hearing,* 38(5), 588–597. https://doi.org/10.1097/AUD.0000000000000427
Google Scholar WorldCat

Paquette, D. (2004). Theorizing the father–child relationship: Mechanisms and developmental outcomes. *Human Development*, 47(4), 193–219. https://doi.org/10.1159/000078723
Google Scholar WorldCat

Pellegrini, A. D. (1988). Elementary-school children's rough-and-tumble play and social competence. *Developmental Psychology,* 24(6), 802.
Google Scholar WorldCat

Pellegrini, A. D. (1994). The rough play of adolescent boys of differing sociometric status. *International Journal of Behavioral Development,* 17(3), 525–540.
Google Scholar WorldCat

Pellegrini, A. D. (2009). *The role of play in human development*. Oxford University Press.
Google Scholar Google Preview WorldCat COPAC

Pellegrini, A. D., & Smith, P. K. (1998). Physical activity play: The nature and function of a neglected aspect of play. *Child Development,* 69(3), 577–598. https://doi.org/10.1111/j.1467-8624.1998.tb06226.x
Google Scholar WorldCat

Piaget, J. (1951). *Play, dreams and imitation in childhood*. Routledge.
Google Scholar Google Preview WorldCat COPAC

Piek, J. P., Bradbury, G. S., Elsley, S. C., & Tate, L. (2008). Motor coordination and social-emotional behaviour in preschool-aged children. *International Journal of Disability, Development and Education,* 55(2), 143–151.
https://doi.org/10.1080/10349120802033592
Google Scholar WorldCat



Rao, Z., & Gibson, J. (2018). Motivations for emotional expression and emotion regulation strategies in Chinese school-aged children. *Motivation and Emotion,* 43(3), 371–386. https://doi.org/10.1007/s11031-018-9740-0
Google Scholar WorldCat

Rieffe, C., Dirks, E., Van Vlerken, W., & Veiga, G. (2016). The empathic mind in children with communication impairments: The case of children who are Deaf or Hard of Hearing (DHH); children with an Autism Spectrum Disorder (ASD); and children with

Specific Language Impairments (SLI). In V. Slaughter & M. D. Rosnay (Eds.), *Theory of mind development in context*. Psychology Press.
Google Scholar Google Preview WorldCat COPAC

Rieffe, C., Oosterveld, P., Miers, A. C., Meerum Terwogt, M., & Ly, V. (2008). Emotion awareness and internalising symptoms in children and adolescents: The Emotion Awareness Questionnaire revised. *Personality and Individual Differences,* 45(8), 756–761. https://doi.org/10.1016/j.paid.2008.08.001
Google Scholar WorldCat

Sander, D., Grandjean, D., & Scherer, K. R. (2005). A systems approach to appraisal mechanisms in emotion. *Neural Networks,* 18(4), 317–352.
Google Scholar WorldCat

Savelsbergh, G. J. P., Netelenbos, J. B., & Whiting, H. T. A. (1991). Auditory perception and the control of spatially coordinated action of deaf and hearing children. *Journal of Child Psychology and Psychiatry,* 32(3), 489–500. https://doi.org/10.1111/j.1469-7610.1991.tb00326.x
Google Scholar WorldCat

Schaan, L., Schulz, A., Nuraydin, S., Bergert, C., Hilger, A., Rach, H., & Hechler, T. (2019). Interoceptive accuracy, emotion recognition, and emotion regulation in preschool children. *International Journal of Psychophysiology,* 138, 47–56. https://doi.org/10.1016/j.ijpsycho.2019.02.001
Google Scholar WorldCat

Scherer, K. R. (2000). Emotion. In M. Hewstone & W. Stroebe (Eds.), *Introduction to social psychology: A European perspective* (3rd ed., pp. 151–191). Blackwell.
Google Scholar Google Preview WorldCat COPAC

Schoemaker, M. M., & Kalverboer, A. F. (1994). Social and affective problems of children who are clumsy: How early do they begin? *Adapted Physical Activity Quarterly,* 11, 130–140.
Google Scholar WorldCat

Smith, P. K. (2010). *Children and play*. Wiley–Blackwell.
Google Scholar Google Preview WorldCat COPAC

Smith, P. K., & Boulton, M. (1990). Rough-and-tumble play, aggression and dominance: Perception and behaviour in children's encounters. *Human Development,* 33(4–5), 271–282. https://doi.org/10.1159/000276524
Google Scholar WorldCat

Tremblay, R. E. (2006). Prevention of youth violence: Why not start at the beginning? *Journal of Abnormal Child Psychology*, 34(4), 480–486. https://doi.org/10.1007/s10802-006-9038-7
Google Scholar WorldCat

Veiga, G., Cunha, L., Pereira, C., Laranjo, L., & Cruz–Ferreira, A. (2020). The effects of rough-and-tumble play on social-emotional functioning of institutionalized children. In R. Mendes, M. J. Coelho, & E. Sá (Eds.), *Estudos de Desenvolvimento Motor da Criança XIII* (pp. 100–102). Universidade de Coimbra.
Google Scholar Google Preview WorldCat COPAC

Veiga, G., de Leng, W., Cachucho, R., Ketelaar, L., Kok, J. N., Knobbe, A., Neto, C., & Rieffe, C. (2017). Social competence at the playground: Preschoolers during recess. *Infant and Child Development, 26*(1), e1957. https://doi.org/10.1002/icd.1957
WorldCat

Veiga, G., Ketelaar, L., De Leng, W., Cachucho, R., Kok, J. N., Knobbe, A., Neto, C., & Rieffe, C. (2017). Alone at the playground. *European Journal of Developmental Psychology,* 14(1), 44–61. https://doi.org/10.1080/17405629.2016.1145111
Google Scholar WorldCat

Veiga, G., O'Connor, R., Neto, C., & Rieffe, C. (2020). Rough-and-tumble play and the regulation of aggression in preschoolers. *Early Child Development and Care* [online publication]. https://doi.org/10.1080/03004430.2020.1828396
Google Scholar WorldCat

Vicente, A. (2019). *As interações de jogo e a competência social em crianças ouvintes e em crianças com surdez ou deficiência auditiva* [Unpublished master dissertation]. University of Évora, Évora.
Google Scholar Google Preview WorldCat COPAC



Vygotsky, L. S. (1967). Play and its role in the mental development of the child. *Soviet Psychology*, *5*(3), 6–18. https://doi.org/10.2753/RPO1061-040505036
Google Scholar WorldCat

Wiefferink, C. H., Rieffe, C., Ketelaar, L., De Raeve, L., & Frijns, J. H. (2013). Emotion understanding in deaf children with a cochlear implant. *Journal of Deaf Studies and Deaf Education,* 18(2), 175–186. https://doi.org/10.1093/deafed/ens042
Google Scholar WorldCat