THE IMPACT OF VIDEO GAMING ON 0-12-YEAR-OLD CHILDREN'S VISUAL COGNITIVE ABILITIES: NARRATIVE REVIEW

Korom, Ágnes[1]
Doctoral School of Linguistics,
Eötvös Loránd University (Hungary)

Bóna, Judit (PhD, Prof.)[2]
Eötvös Loránd University (Hungary)

Konok, Veronika (PhD)[3]
Eötvös Loránd University (Hungary)

Cite: Korom, Ágnes, Bóna, Judit, & Konok, Veronika (2025). The Impact of Video Gaming on 0-12-Year-Old Children's Visual Cognitive Abilities: Narrative Review. *Különleges Bánásmód Interdiszciplináris folyóirat [Special Treatment Interdisciplinary Journal], 11*(3), 157–170.
Idézés: DOI https://doi. org/10.18458/KB.2025.3.157

EP / EE: Ethics Permission / Etikai engedély: KB/2025/0033

Reviewers: *Public Reviewers / Nyilvános Lektorok:*
Lektorok:
1. Murányi, Sarolta (PhD), Institute of Hungarian Linguistics and Finno-Ugric Studies, Eötvös Loránd University (Hungary)
2. Tóth, Beáta (PhD), Department of Behavioural Sciences, University of Debrecen (Hungary)

Anonymous reviewers / Anonim lektorok:
3. Anonymous reviewer (PhD) / Anonim lektor (PhD)
4. Anonymous reviewer (PhD) / Anonim lektor (PhD)

Abstract

This narrative review explores the growing prevalence of video gaming among children and its impact on their visual cognitive development, particularly attentional mechanisms and visual information processing. As games are introduced at younger ages and become increasingly prevalent, concerns emerge about their effects on developing cognitive systems. The review synthesises current evidence on how fast-

[1] Korom, Ágnes, PhD student, Doctoral School of Linguistics, Eötvös Loránd University (Hungary). E-mail: koromagnes@gmail.com ORCID: https://orcid.org/0009-0004-3132-4240

[2] Bóna, Judit (PhD, Prof.), Institute of Hungarian Linguistics and Finno-Ugric Studies, Eötvös Loránd University (Hungary). E-mail: bona.judit@btk.elte.hu ORCID: https://orcid.org/0000-0003-2369-1636

[3] Konok, Veronika (PhD), Department of Ethology, Eötvös Loránd University (Hungary). E-mail: konok.veronika@ttk.elte.hu ORCID: https://orcid.org/0000-0001-6660-3603

paced video games challenge children's visual processing, filling a gap in the literature, which has mostly focused on adolescents and adults. It outlines childhood gaming habits, key visual cognitive developments, and the effects of gaming on these processes. Research suggests that video gaming can enhance spatial-visual attention and stimulus processing speed; however, the effects vary depending on age, game type, offline engagement, and parental involvement. Early and excessive gaming may lead to cognitive overload and attention difficulties that extend beyond gaming contexts. While games may enhance divided attention, these skills often fail to transfer effectively to real-world tasks, such as learning. The review concludes with practical considerations for age-appropriate, balanced gaming to support healthy cognitive development.

Keywords: video gaming in childhood, cognitive effects of video games, narrative review
Disciplines: psychology, education

Absztrakt

A VIDEÓJÁTÉKOZÁS HATÁSA 0-12 ÉVES GYEREKEK VIZUÁLIS-KOGNITÍV KÉPESSÉGEIRE: SZAKIRODALMI ÁTTEKINTÉS

Jelen szakirodalmi áttekintés a videójátékok egyre növekvő elterjedtségét, valamint annak hatását vizsgálja a gyermekkori vizuális kognitív fejlődésre, különös tekintettel a figyelmi mechanizmusokra és a vizuális információfeldolgozásra. Mivel a videójátékok egyre fiatalabb korban jelennek meg és egyre elterjedtebbek a gyerekek körében, aggodalmak merülnek fel a fejlődő kognitív rendszerekre gyakorolt hatásaikkal kapcsolatban. Az áttekintés összefoglalja a jelenlegi kutatási eredményeket arról, hogy a gyors tempójú videójátékok milyen módon állítanak kihívást a gyermekek vizuális feldolgozó rendszerének működése elé. Ezzel fontos hiányt pótol a vonatkozó szakirodalomban, amely eddig elsősorban a serdülő- és felnőttkori hatásokra fókuszált. A tanulmány bemutatja a gyermekek videójáték-használati szokásait, a vizuális kognitív fejlődés főbb állomásait, valamint a játékhasználat ezekre gyakorolt hatásait. A kutatási eredmények szerint a videójátékok javíthatják a téri-vizuális figyelmet és az ingerfeldolgozás sebességét; ugyanakkor ezek a hatások az életkortól, a játék típusától, az offline tevékenységek arányától, valamint a szülői bevonódástól függően eltérőek lehetnek. A korai és túlzott mértékű játékhasználat kognitív túlterheléshez és figyelemzavarokhoz vezethet, amelyek túlmutatnak a játék kontextusán. Bár bizonyos videójátékok javíthatják a megosztott figyelmet, ezek a készségek gyakran nem vihetők át hatékonyan a valós életben jelentkező feladatokra, például a tanulásra. A tanulmány gyakorlati szempontokkal zárul a kiegyensúlyozott játékhasználattal kapcsolatban, amely elősegítheti az egészséges kognitív fejlődést.

Kulcsszavak: videójátékozás gyerekkorban, videójátékok kognitív hatásai, áttekintő tanulmány
Diszciplína: pszichológia, oktatás

Introduction

Digital activities have become an integral part of children's daily lives, with video gaming emerging as one of the most prevalent forms among those under 12 years of age (Ofcom, 2024). The rise of touchscreen devices has made gaming more accessible even to very young children, raising concerns about its impact on cognitive development.

Video games demand rapid visual processing in dynamic environments, intensively engaging the developing visual cognitive system. Given that children's nervous systems are still maturing and highly sensitive to external input (e.g., Moyano et

al., 2022), understanding the cognitive consequences of gaming has become increasingly urgent. The cognitive effects of video games have been examined predominantly in adults and adolescents (e.g., Sampalo et al., 2023; Virgilio, 2024), while research focusing on younger children remains limited. This narrative review seeks to address this gap by exploring the specific ways in which video gaming may influence the development of visual cognitive functions during early and middle childhood. Recognising both the potential risks and benefits is essential – not only to prevent harmful outcomes through informed interventions, but also to identify and harness possible cognitive gains, particularly in contexts where video games are integrated into educational or developmental frameworks.

This narrative review aims to examine both the correlations and the short- and long-term effects of video gaming on the development of children's visual cognitive functions. It begins by summarysing gaming habits in children aged 0–12, followed by an overview of visual cognitive development, and concludes with an analysis of the relationship between gaming and visuo-cognitive outcomes. Ultimately, the review highlights practical implications for educators and caregivers when incorporating video games into daily routines and educational environments.

Video Gaming Habits in Childhood

Video gaming is the second most common digital activity among children, following video watching (Konok et al., 2020; Rideout et al., 2022). In the U.S., 25% of children under 3 already engage in gaming (Levine et al., 2019), and the age of first exposure to online and multiplayer games is steadily decreasing (Ofcom, 2024; Rideout & Robb, 2020). Children under 8 spend an average of 23 minutes daily on gaming, which rises to 1 hour and 27 minutes for those aged 8–12 (Rideout et al., 2022). Pandemic-related restrictions further amplified these trends (Donati et al., 2021). Hungarian data reflect similar patterns: three-quarters of 6–18-year-olds play video games, with an average daily playtime of 1.14 hours; 7% play nearly 3 hours per day (Good Gamer, 2021).

Game genres include puzzle, action, simulation, and strategy (Lucas & Sherry, 2004), although overlaps have prompted more refined classifications (Király et al., 2023). In Hungary, sports/racing, strategy, and shooter games (e.g., FIFA, Civilisation, Call of Duty) are particularly popular (Good Gamer, 2021).

Children are drawn to games due to their visually dynamic design, frequent neurological rewards, and immersive experience or "flow" (Han et al., 2007; Lau et al., 2017; Weber et al., 2009). Enjoyment is further enhanced by imaginative content, interactive challenges, and social elements (Ofcom, 2024).

Development of Visual Cognitive Abilities in 0-12-year-old Children

Visual cognitive abilities develop significantly during childhood, particularly up to age 12 (Hendry et al., 2019). This process is shaped by both innate capacities and environmental input, with the latter playing a major role due to the plasticity of the developing nervous system (Moyano et al., 2022, 2023). Everyday experiences—such as object manipulation, movement, and caregiver interactions—support this development (Sun et al., 2024; Werchan et al., 2024). These abilities are also trainable (see Rueda et al., 2005, for a comprehensive review), which may explain why video games can have a notable impact during this sensitive period.

Attention orientation (attention toward specific locations or objects in the environment) begins in infancy, but the ability to control attention intentionally and inhibit responses (i.e., executive attention) matures gradually, continuing into

adolescence (Oakes, 2023). Early attention is primarily stimulus-driven (bottom-up), and even 5– to 6-year-olds struggle to ignore distractions (Bartgis et al., 2008). Top-down control (i.e., goal-directed attention) begins to emerge before preschool (e.g., Holmboe et al., 2021) but becomes significantly more effective around age 6–7 due to the maturation of the executive attention network (Rueda et al., 2005). By the age of 12, children process complex visual stimuli more quickly and accurately (Hommel et al., 2004).

Among attention components, vigilance (sustained alertness to stimuli) appears early, enabling children to engage with their environment (Hendry et al., 2019). During the first four years, sustained attention mostly occurs in social interactions (Bradshaw et al., 2024), though children are still easily distracted (Richards, 1988). Over time, this improves, and school-age children can focus even in distracting environments (Diamond, 2006). Performance is best when tasks are optimally challenging—neither too easy nor too hard (Talalay, 2024)—and feedback helps maintain attention, even in children with attention difficulties (Bubnik et al., 2015).

Selective attention (the ability to focus on relevant stimuli while ignoring others) also improves with age. Preschoolers often struggle to filter distractions (Gerhardstein & Rovee-Collier, 2002), but by ages 9–11, selective attention strengthens, although it still falls short of adult levels (Donnelly et al., 2007). Divided attention (monitoring two visual features at once) is also difficult for young children (Ólafsdóttir et al., 2016) but improves notably around ages 6–7 and reaches near-adult levels by age 12 (Boot et al., 2012; Turoman et al., 2021).

Spatial-visual abilities develop through physical exploration (Misirli et al., 2019) and later through reading (Hoyos et al., 2021). Visual search efficiency improves significantly by the end of preschool and continues to improve until approximately age 11–12 (Ickx et al., 2017). These skills are linked to oculomotor control (voluntary eye movement), which stabilises around ages 4–6 (Rütsche et al., 2006) and becomes adult-like by age 12 (Bucci & Seassau, 2012).

The Correlations and Impacts of Video Gaming on Visual Cognitive Abilities in Childhood

Compared to routine visual tasks, video gaming immerses children in an exceptionally intense visual environment. The fast-paced, stimulus-rich context challenges their still-developing cognitive systems by requiring constant division and maintenance of attention, rapid stimulus selection, and continuous sensory integration. Success depends on children's ability to adapt swiftly to the changing demands of the virtual world using flexible strategies (Bavelier et al., 2012).

Consequently, video gaming has clear potential to shape the development of visual cognitive abilities. Both regular gaming and structured game training have been shown to enhance children's performance in specific visual cognitive tasks (Bediou et al., 2018; Blumberg et al., 2019; Powers et al., 2013). Studies comparing gamers and non-gamers have found that regular players exhibit more advanced selective, divided, and visuospatial attention, enabling quicker and more accurate responses, as well as broader attentional capacities across spatial and temporal domains (M.-S. Chen et al., 2019; Dye et al., 2009a, 2009b; Dye & Bavelier, 2010).

Video game training offers a way to study gaming's longer-term effects more precisely, showing improvements in spatial-visual abilities (De Lisi & Wolford, 2002; Passig & Eden, 2001), faster visual information processing (Mackey et al., 2011), and greater executive attention efficiency, even in preschoolers (Liu et al., 2019). For example, Flynn & Richert (2018) found that 20 minutes of cognitively demanding video game play

improved executive function in 7–12-year-olds more than the same time spent in free physical activity.

Pujol et al. (2016) found improved white matter integrity in brain areas related to visual processing in children who regularly play video games. Cain et al. (2014) demonstrated that gamers' faster reaction times result from better top-down control over attention, rather than simply quicker stimulus processing. Supporting this, Chisholm et al. (2010) reported gamers respond faster to targets amid distractions while sustaining focus. This suggests that video gaming improves top-down attention control over time, as also noted by Bavelier & Green (2019). These findings indicate that habitual gaming may enhance managing complex visual tasks in daily life (like multitasking or navigating crowds), speed decision-making (e.g., in sports or traffic), and improve adaptability to new or unexpected stimuli (Green & Bavelier, 2003; Trick et al., 2005).

Nevertheless, some studies show contradictory results. Like adults, children who play video games do not always have better stimulus processing than non-players, despite faster reaction times (Heimler et al., 2014; Yuji, 1996). For example, a 9-minute digital game had no greater effect on executive function in 2.5-year-olds than the same amount of time spent on physical activity (Antrilli & Wang, 2018). Samson et al. (2021) found that daily gamers aged 4–7 showed better selective attention but no difference in sustained attention or executive function compared to non-gamers. Other research suggests that intensive use of touchscreen devices, including games, in early childhood (1–6 years) speeds reaction times but weakens intentional attention control over time (Jin & Lin, 2022; Portugal et al., 2021, 2023), possibly outweighing cognitive benefits (Rocha & Nunes, 2020). Additionally, heavy gaming is linked to attention problems and ADHD-like symptoms in young children at home and school (e.g., Gentile et al., 2012; Jamel et al., 2019). Neuroimaging studies confirm these harmful effects on visual processing and attention control in children and adolescents (Hutton et al., 2022; Kwak et al., 2020). Farchakh et al. (2020) also found that problematic gaming—characterised by poor control, prioritisation over other activities, and preoccupation—is associated with daily attention issues, such as forgetfulness, impulsivity, and frequent mistakes, in children aged 9–11.

The inconsistencies in findings about the effects of video games on visual cognition may partly result from methodological differences, such as the use of varied measurement tools and study contexts (Jeong et al., 2020; Welker, 2022). The clearest evidence for video gaming's positive impact remains the enhancement of attentional functions shown in specific laboratory tasks using screens (e.g., Dye & Bavelier, 2004). At the same time, survey data reveal links between video gaming and common attention problems in the same age groups (Gentile et al., 2012).

To understand these divergent results, additional moderating and mediating factors must be considered. For example, adolescents from lower socioeconomic backgrounds tend to gain more cognitive benefits from video game training than their more advantaged peers, likely due to fewer alternative developmental opportunities (e.g., Sauce et al., 2022; Vashisht & Navqi, 2024). Parental mediation—more common among parents with higher education and younger children (e.g., Kousari & Mehrabi, 2017)—involves encouraging mindful media use, active involvement, and setting limits on content and time. This mediation can reduce negative effects or even boost positive outcomes of gaming (e.g., Antrilli & Wang, 2018; Yu et al., 2021). Participation in developmental activities and social interaction outside gaming also protects against potential mental health risks (Liau et al., 2015). Additionally, active video gaming with physical movement (like dancing or sports) shows

positive effects on executive functioning in both the short and long term (Best, 2012; J. Chen et al., 2023).

The type, content, and characteristics of video games influence their effects on visual cognitive development (Cunningham & Green, 2023). Positive correlations are primarily linked to action video games, characterised by fast-moving, frequently changing stimuli that require efficient visual processing and rapid shifting and sharing of spatial-visual attention (Choi et al., 2020; Dye & Bavelier, 2004). Developmental, logical, and strategic games also contribute to strengthening attention control (Choi et al., 2020; Monteiro et al., 2023). Li et al. (2018) found that exposure to unrealistic, fantastical content on traditional screens reduces executive function efficiency in preschoolers; however, this negative effect is not observed during interactive play with similar content. Conversely, increasing evidence suggests that violent, fast-paced, and chaotic video games have pronounced negative effects on children's attention processes and cognitive performance, even after short periods of exposure (Brawer, 2015; Ceranoglu et al., 2023).

The motivational features of video games (e.g., challenges, rewards, social interaction opportunities) promote prolonged engagement, which can influence development in varied ways. Greater cognitive involvement may enhance developmental effects (Alghamdi & Holland, 2017; Flynn & Richert, 2018). However, excessive immersion can lead to problematic use in children, similar to adults (Griffiths & Nuyens, 2017). Personal motivation also impacts cognitive effects; for instance, children who game to alleviate stress or compensate for unmet emotional needs may experience impaired development of key competencies due to excessive, unilateral gaming (Kardefelt-Winther, 2014).

Pre-existing attention problems also influence how video gaming affects cognition. Children with attention deficits often play more video games, partly because these games satisfy their need for stimulation and trigger the release of dopamine in the brain (Lee et al., 2017; Masi et al., 2021). However, attention problems are a key risk factor for problematic gaming, which in turn may worsen everyday attention difficulties (Bender et al., 2020; Paulus et al., 2018). Concurrently, consciously designed therapeutic games can support attention and executive functioning in children with ADHD (Hou et al., 2023; Kim & Lee, 2025).

The cognitive effects of video games are significantly influenced by the child's age, due to developmental differences in their visual and attentional systems. Studies show that while physical activity is more beneficial for executive functioning in preschoolers, cognitively demanding video games are more effective during school years (Antrilli & Wang, 2018; Flynn & Richert, 2018). Early intensive gameplay—before school age—may harm executive attention development more than if started later (Jin & Lin, 2022; Portugal et al., 2021). Still, starting before age 12 may enhance visual cognition more significantly, likely due to greater brain plasticity (Hartanto et al., 2016; Vashisht & Navqi, 2024). Younger children also tend to engage less with aggressive content, which can otherwise impede development (Suziedelyte, 2012). However, benefits are not linear: younger adolescents (11–12 years old) may gain fewer executive function advantages than older teens (17–19 years old) (Zioga et al., 2024).

Additionally, studies suggest that the cognitive benefits of video gaming are strongly influenced by the gameplay's level, following an inverted U-shaped pattern—where moderate gaming yields the most advantages, particularly in younger children (ages 7–9) (Pujol et al., 2016; Tahiroglu et al., 2010). While stimulating digital environments can support learning (Gros, 2007), excessive use may cause cognitive overload and impair performance (Kalyuga & Plass, 2009). Notably, in developing

brains, the line between beneficial stimulation and overload is often narrow.

Highly stimulating, fast-paced video games place heavy demands on the attentional system's limited capacity, depleting the cognitive resources needed for sustained attention and efficient visual processing (Pakai-Stecina & Zsidó, 2023). This effect is intensified by multitasking—such as the simultaneous use of multiple screens—which further impairs attentional regulation and visual efficiency (Cardoso-Leite et al., 2016; Soldatova et al., 2022). These impacts are particularly detrimental before ages 6–8, when executive and attentional control networks are still developing (Darby et al., 2021). For instance, in preschoolers, a 5-minute session of fast-paced gaming temporarily improved spatially shared attention but reduced selective attention (Konok et al., 2021).

Overstimulation may induce cognitive overload—a state of mental fatigue caused by excessive information processing—which impairs everyday attention and behavioural regulation across age groups, regardless of game content (Levine et al., 2007; West et al., 2020). While even adolescents with mature cognitive functions may experience long-term detriments from excessive gaming (Trisolini et al., 2018; Virgilio, 2024), the risks are even greater for younger children, whose neural systems are more vulnerable (Farchakh et al., 2020; Hutton et al., 2022).

Exposure to highly dynamic gaming environments has been linked to increased reliance on exogenously driven attention—attention triggered by external stimuli (Portugal et al., 2021). While this may enhance responsiveness during gameplay (Anderson & Druker, 2013), overexposure can habituate the nervous system to intense sensory input, weakening top-down attentional control in low-stimulation settings such as classrooms or daily routines. This shift may lead to heightened novelty-seeking, attentional instability, and reduced processing efficiency in tasks requiring sustained, internally directed attention (Christakis et al., 2012; Gentile et al., 2012). Since educational contexts typically demand systematic processing rather than reactivity (Landhuis et al., 2007), excessive gaming may compromise children's ability to maintain focus. Although short-term improvements in selective visual attention may occur (Trisolini et al., 2018), long-term overexposure has been linked to persistent attentional control deficits, which can sometimes resemble symptoms of ADHD (Chaarani et al., 2022; Gentile, 2011). Moreover, excessive digital stimulation has been linked to rapid but superficial processing styles (Steenbergen et al., 2015; Tan & Xu, 2020), which can hinder performance in cognitively demanding learning environments.

Although ongoing research continues to examine the extent to which video game - enhanced cognitive abilities can be transferred to everyday tasks (Green & Bavelier, 2012; Mayer, 2014; Simons et al., 2016), current findings suggest that while visual processing efficiency may improve, such gains often fail to translate into better performance in contexts requiring sustained attention, impulse control, or goal-directed behaviour (e.g., academic learning or task persistence).

Pedagogical and Educational Implications

These findings suggest that, when used appropriately, video games may serve as valuable tools for developing specific cognitive abilities in children. Therefore, educators and caregivers should recognise the potential benefits of video gaming, particularly fast-paced games that demand rapid information processing and divided attention.

However, it is crucial to balance these benefits with awareness of potential risks associated with excessive or inappropriate gaming. Age-appropriate guidelines should promote moderate, time-limited, and content-conscious use of video games, especially during early childhood when cognitive

and neural systems are still developing. Parental mediation and structured guidance can maximise the cognitive gains while minimising the risks of cognitive overload, attention deficits, or reduced performance in everyday tasks. Additionally, fostering both offline cognitive and physical activities alongside video gaming can provide a well-rounded developmental environment.

Integrating media literacy and self-regulation strategies into early educational curricula can further empower children to engage consciously and critically with digital media. This balanced pedagogical approach acknowledges the dual nature of video games, recognising them as both potential cognitive enhancers and sources of risk, while aiming to support healthy attention development and overall cognitive well-being in growing children.

Summary

In the contemporary era, video gaming has become increasingly prevalent among children, with a notable decline in the age at which this activity typically begins. Fast-paced games present a visually challenging environment, requiring players to rapidly identify target stimuli amidst distractions, thereby exerting considerable pressure on children's still-developing visual and attentional systems.

Research has shown that such games may enhance spatial-visual attention and the speed of stimulus processing. However, excessive and early exposure to video gaming can lead to cognitive overload, potentially resulting in attention deficits and impairments that extend beyond the gaming context. While these games may train children to process stimuli quickly and divide their attention efficiently, the skills acquired are often less applicable in everyday static tasks, such as learning or classroom activities.

Practical implications regarding the pedagogical and parental management of video gaming, including recommendations for age-appropriate guidelines and balanced digital media use, are discussed in a separate section.

References

Alghamdi, J., & Holland, C. (2017). Game-Play: Effects of Online Gamified and Game-Based Learning on Dispositions, Abilities and Behaviors of Primary Learners. Tomorrow's Learning: Involving Everyone. Learning with and about Technologies and Computing. *11th IFIP TC 3 World Conference on Computers in Education, WCCE 2017*, 55–63. DOI https://doi.org/10.1007/978-3-319-74310-3_7

Anderson, B., & Druker, M. (2013). Attention improves perceptual quality. *Psychonomic Bulletin & Review, 20*(1), 120–127. DOI https://doi.org/10.3758/s13423-012-0323-x

Antrilli, N. K., & Wang, S. (2018). Toddlers on touchscreens: immediate effects of gaming and physical activity on cognitive flexibility of 2.5-year-olds in the US. *Journal of Children and Media, 12*(4), 496–513. DOI https://doi.org/10.1080/17482798.2018.1486332

Bartgis, J., Thomas, D. G., Lefler, E. K., & Hartung, C. M. (2008). The development of attention and response inhibition in early childhood. *Infant and Child Development, 17*(5), 491–502. DOI https://doi.org/10.1002/icd.563

Bavelier, D., & Green, C. S. (2019). Enhancing Attentional Control: Lessons from Action Video Games. *Neuron, 104*(1), 147–163. DOI https://doi.org/10.1016/j.neuron.2019.09.031

Bavelier, D., Green, C. S., Pouget, A., & Schrater, P. (2012). Brain Plasticity Through the Life Span: Learning to Learn and Action Video Games. *Annual Review of Neuroscience, 35*(1), 391–416. DOI https://doi.org/10.1146/annurev-neuro-060909-152832

Bediou, B., Adams, D. M., Mayer, R. E., Tipton, E., Green, C. S., & Bavelier, D. (2018). Meta-analysis of action video game impact on perceptual, attentional, and cognitive skills. *Psychological Bulletin, 144*(1), 77–110. DOI https://doi.org/10.1037/bul0000130

Bender, P. K., Kim, E.-L., & Gentile, D. A. (2020). Gaming Disorder in Children and Adolescents: Risk Factors and Preventive Approaches. *Current Addiction Reports, 7*(4), 553–560. DOI https://doi.org/10.1007/s40429-020-00337-5

Best, J. R. (2012). Supplemental Material for Exergaming Immediately Enhances Children's Executive Function. *Developmental Psychology, 48*(5), 1501–1510. DOI https://doi.org/10.1037/a0026648.supp

Blumberg, F. C., Deater-Deckard, K., Calvert, S. L., Flynn, R. M., Green, C. S., Arnold, D., & Brooks, P. J. (2019). Digital Games as a Context for Children's Cognitive Development: Research Recommendations and Policy

Considerations. *Social Policy Report, 32*(1), 1–33. DOI https://doi.org/10.1002/sop2.3

Boot, F. H., Pel, J. J. M., Evenhuis, H. M., & van der Steen, J. (2012). Quantification of Visual Orienting Responses to Coherent Form and Motion in Typically Developing Children Aged 0–12 Years. Investigative *Opthalmology & Visual Science, 53*(6), 2708. DOI https://doi.org/10.1167/iovs.11-8893

Bradshaw, J., Fu, X., & Richards, J. E. (2024). Infant sustained attention differs by context and social content in the first 2 years of life. *Developmental Science, 27*(4), 1–14. DOI https://doi.org/10.1111/desc.13500

Brawer, J. W. (2015). Violent Video Games May Kill Your Short-Term Focus: Violent video games may negatively affect a player's attention and concentration on a short-term basis after brief exposure. *Journal of Young Investigators, 29*(3), 7–10.

Bubnik, M. G., Hawk, L. W., Pelham, W. E., Waxmonsky, J. G., & Rosch, K. S. (2015). Reinforcement Enhances Vigilance Among Children With ADHD: Comparisons to Typically Developing Children and to the Effects of Methylphenidate. *Journal of Abnormal Child Psychology, 43*(1), 149–161.DOIhttps://doi.org/10.1007/s10802-014-9891-8

Bucci, M. P., & Seassau, M. (2012). Saccadic eye movements in children: a developmental study. *Experimental Brain Research, 222*(1–2), 21–30. DOI https://doi.org/10.1007/s00221-012-3192-7

Buss, A., McCraw, A., Lowery, K., Heim, H., Eddings, R., & Sullivan, J. (2023). Neuro-cognitive mechanisms of attentional control development. *Journal of Vision, 23*(9), 5910. DOI https://doi.org/10.1167/jov.23.9.5910

Cain, M. S., Prinzmetal, W., Shimamura, A. P., & Landau, A. N. (2014). Improved control of exogenous attention in action video game players. *Frontiers in Psychology*, *5*(FEB), 1–9. DOI https://doi.org/10.3389/fpsyg.2014.00069

Cardoso-Leite, P., Kludt, R., Vignola, G., Ma, W. J., Green, C. S., & Bavelier, D. (2016). Technology consumption and cognitive control: Contrasting action video game experience with media multitasking. *Attention, Perception, & Psychophysics, 78*(1), 218–241. DOI https://doi.org/10.3758/s13414-015-0988-0

Ceranoglu, T. A., Weigle, P. E., & Gerwin, R. (2023). Understanding Video Games: A Child and Adolescent Psychiatrist's Call of Duty. *Journal of the American Academy of Child & Adolescent Psychiatry, 62*(10), S421. DOI https://doi.org/10.1016/j.jaac.2023.07.969

Chaarani, B., Ortigara, J., Yuan, D., Loso, H., Potter, A., & Garavan, H. P. (2022). Association of Video Gaming With Cognitive Performance Among Children. *JAMA Network Open, 5*(10), e2235721. DOI https://doi.org/10.1001/jamanetworkopen.2022.35721

Chen, J., Zhou, X., Wu, X., Gao, Z., & Ye, S. (2023). Effects of exergaming on executive functions of children: a systematic review and meta-analysis from 2010 to 2023. *Archives of Public Health, 81*(1), 182. DOI https://doi.org/10.1186/s13690-023-01195-z

Chen, M.-S., Chiu, T.-S., & Chen, W.-R. (2019). Differences in Visual Attention Performance Between Action Game Playing and Non-playing Children. In S. Bagnara, R. Tartaglia, S. Albolino, T. Alexander, & Y. Fujita (Eds.), *Proceedings of the 20th Congress of the International Ergonomics Association (IEA 2018)* (pp. 639–648). Springer, Cham. DOI https://doi.org/10.1007/978-3-319-96065-4_67

Chisholm, J. D., Hickey, C., Theeuwes, J., & Kingstone, A. (2010). Reduced attentional capture in action video game players. Attention, *Perception, & Psychophysics, 72*(3), 667–671. DOI https://doi.org/10.3758/APP.72.3.667

Choi, E., Shin, S.-H., Ryu, J.-K., Jung, K.-I., Kim, S.-Y., & Park, M.-H. (2020). Commercial video games and cognitive functions: video game genres and modulating factors of cognitive enhancement. *Behavioral and Brain Functions, 16*(1), 2. DOI https://doi.org/10.1186/s12993-020-0165-z

Christakis, D. A., Ramirez, J. S. B., & Ramirez, J. M. (2012). Overstimulation of newborn mice leads to behavioral differences and deficits in cognitive performance. *Scientific Reports, 2*. DOI https://doi.org/10.1038/srep00546

Colombo, J. (2001). The Development of Visual Attention in Infancy. *Annual Review of Psychology, 52*(1), 337–367. DOI https://doi.org/10.1146/annurev.psych.52.1.337

Cunningham, E. G., & Green, C. S. (2023). Cognitive Skills Acquired From Video Games. In J. F. Nussbaum & M. Powers (Eds.*), Oxford Research Encyclopedia of Communication.* Oxford University Press. DOI https://doi.org/10.1093/acrefore/9780190228613.013.1468

Darby, K. P., Deng, S. W., Walther, D. B., & Sloutsky, V. M. (2021). The Development of Attention to Objects and Scenes: From Object-Biased to Unbiased. *Child Development, 92*(3), 1173–1186. DOI https://doi.org/10.1111/cdev.13469

De Lisi, R., & Wolford, J. L. (2002). Improving Children's Mental Rotation Accuracy With Computer Game Playing. *The Journal of Genetic Psychology, 163*(3), 272–282. DOI https://doi.org/10.1080/00221320209598683

Diamond, A. (2002). Normal development of prefrontal cortex from birth to young adulthood: Cognitive functions, anatomy, and biochemistry. In D. T. Stuss & R. T. Knight (Eds.), *Principles of frontal lobe function* (pp. 466–503). Oxford University Press.

Diamond, A. (2006). The early development of executive functions. In E. Bialystok & F. Craik (Eds.), *Lifespan*

Cognition: Mechanisms of Change (pp. 7–95). Oxford University Press.

Donati, M. A., Guido, C. A., De Meo, G., Spalice, A., Sanson, F., Beccari, C., & Primi, C. (2021). Gaming among Children and Adolescents during the COVID-19 Lockdown: The Role of Parents in Time Spent on Video Games and Gaming Disorder Symptoms. International *Journal of Environmental Research and Public Health, 18*(12), 6642. DOI https://doi.org/10.3390/ijerph18126642

Donnelly, N., Cave, K., Greenway, R., Hadwin, J. A., Stevenson, J., & Sonuga-Barke, E. (2007). Visual search in children and adults: Top-down and bottom-up mechanisms. *Quarterly Journal of Experimental Psychology, 60*(1), 120–136. DOI https://doi.org/10.1080/17470210600625362

Dye, M. W. G., & Bavelier, D. (2004). Playing video games enhances visual attention in children. *Journal of Vision, 4*(11), 40–40. DOI https://doi.org/10.1167/4.11.40

Dye, M. W. G., & Bavelier, D. (2010). Differential development of visual attention skills in school-age children. *Vision Research, 50*(4), 452–459. DOI https://doi.org/10.1016/j.visres.2009.10.010

Dye, M. W. G., Green, C. S., & Bavelier, D. (2009a). The development of attention skills in action video game players. *Neuropsychologia,* 47(8–9), 1780–1789. DOI https://doi.org/10.1016/j.neuropsychologia.2009.02.002

Dye, M. W. G., Green, C. S., & Bavelier, D. (2009b). Increasing Speed of Processing With Action Video Games. Current Directions in *Psychological Science, 18*(6), 321–326. DOI https://doi.org/10.1111/j.1467-8721.2009.01660.x

Farchakh, Y., Haddad, C., Sacre, H., Obeid, S., Salameh, P., & Hallit, S. (2020). Video gaming addiction and its association with memory, attention and learning skills in Lebanese children. *Child and Adolescent Psychiatry and Mental Health, 14*(1), 46. DOI https://doi.org/10.1186/s13034-020-00353-3

Flynn, R. M., & Richert, R. A. (2018). Cognitive, not physical, engagement in video gaming influences executive functioning. *Journal of Cognition and Development, 19*(1), 1–20. DOI https://doi.org/10.1080/15248372.2017.1419246

Gamer, G. (2021). Good Gamer felmérése a Generali Biztosító megbízásából a gyerekek videójátékozási szokásairól.

Gentile, D. A. (2011). The Multiple Dimensions of Video Game Effects. *Child Development Perspectives, 5*(2), 75–81. DOI https://doi.org/10.1111/j.1750-8606.2011.00159.x

Gentile, D. A., Swing, E. L., Lim, C. G., & Khoo, A. (2012). Video game playing, attention problems, and impulsiveness: Evidence of bidirectional causality. *Psychology of Popular Media Culture, 1*(1), 62–70. DOI https://doi.org/10.1037/a0026969

Gerhardstein, P., & Rovee-Collier, C. (2002). The Development of Visual Search in Infants and Very Young Children. *Journal of Experimental Child Psychology, 81*(2), 194–215. DOI https://doi.org/10.1006/jecp.2001.2649

Green, C. S., & Bavelier, D. (2003). Action video game modifies visual selective attention. *Nature, 423*(6939), 534–537. DOI https://doi.org/10.1038/nature01647

Green, C. S., & Bavelier, D. (2012). Learning, Attentional Control, and Action Video Games. *Current Biology, 22*(6), R197–R206. DOI https://doi.org/10.1016/j.cub.2012.02.012

Griffiths, M. D., & Nuyens, F. (2017). An Overview of Structural Characteristics in Problematic Video Game Playing. *Current Addiction Reports, 4*(3), 272–283. DOI https://doi.org/10.1007/s40429-017-0162-y

Gros, B. (2007). Digital Games in Education. *Journal of Research on Technology in Education, 40*(1), 23–38. DOI https://doi.org/10.1080/15391523.2007.10782494

Han, D. H., Lee, Y. S., Yang, K. C., Kim, E. Y., Lyoo, I. K., & Renshaw, P. F. (2007). Dopamine Genes and Reward Dependence in Adolescents with Excessive Internet Video Game Play. *Journal of Addiction Medicine, 1*(3), 133–138. DOI https://doi.org/10.1097/ADM.0b013e31811f465f

Hartanto, A., Toh, W. X., & Yang, H. (2016). Age matters: The effect of onset age of video game play on task-switching abilities. Attention, *Perception, & Psychophysics, 78*(4), 1125–1136. DOI https://doi.org/10.3758/s13414-016-1068-9

Heimler, B., Pavani, F., Donk, M., & van Zoest, W. (2014). Stimulus- and goal-driven control of eye movements: Action videogame players are faster but not better. *Attention, Perception, & Psychophysics, 76*(8), 2398–2412. DOI https://doi.org/10.3758/s13414-014-0736-x

Hendry, A., Johnson, M. H., & Holmboe, K. (2019). Early Development of Visual Attention: Change, Stability, and Longitudinal Associations. *Annual Review of Developmental Psychology, 1*(1), 251–275. DOI https://doi.org/10.1146/annurev-devpsych-121318-085114

Holmboe, K., Larkman, C., de Klerk, C., Simpson, A., Bell, M. A., Patton, L., Christodoulou, C., & Dvergsdal, H. (2021). The early childhood inhibitory touchscreen task: A new measure of response inhibition in toddlerhood and across the lifespan. *PLOS ONE, 16*(12), e0260695. DOI https://doi.org/10.1371/journal.pone.0260695

Hommel, B., Li, K. Z. H., & Li, S.-C. (2004). Visual Search Across the Life Span. *Developmental Psychology, 40*(4), 545–558. DOI https://doi.org/10.1037/0012-1649.40.4.545

Hou, Y., Dai, S., Shen, Y., & Ou, I. (2023). Novel Attention Training in Children with Attention Deficit/Hyperactivity Disorder. *Global Clinical and Translational Research, 5*(1), 12–15. DOI https://doi.org/10.36316/gcatr.05.0048

Hoyos, P. M., Kim, N. Y., Cheng, D., Finkelston, A., &

Kastner, S. (2021). Development of spatial biases in school-aged children. *Developmental Science, 24*(3), e13053. DOI https://doi.org/10.1111/desc.13053

Hutton, J. S., Dudley, J., & Dewitt, T. (2022). Associations Between Digital Media Use and Brain Surface Structural Measures in Preschool-Aged Children. *Research Square,* 1–18. DOI https://doi.org/10.21203/rs.3.rs-1383387/v1

Ickx, G., Bleyenheuft, Y., & Hatem, S. M. (2017). Development of Visuospatial Attention in Typically Developing Children. *Frontiers in Psychology, 8*(DEC), 1–14. DOI https://doi.org/10.3389/fpsyg.2017.02064

Jamel, M. F., Shafiq, W. S., & Abdul-wahid, S. S. (2019). The Impact of Computer- Based Video-games Devices on the Children's Health. Diyala *Journal of Medicine, 16*(1), 94–100. DOI https://doi.org/10.26505/DJM.16014200801

Jeong, J. H., Park, H.J., Yeo, S.H., & Kim, H. (2020). A Multimodal Analysis Combining Behavioral Experiments and Survey-Based Methods to Assess the Cognitive Effect of Video Game Playing: Good or Evil? *Sensors, 20*(11), 3219. DOI https://doi.org/10.3390/s20113219

Jin, Y.R., & Lin, L.Y. (2022). Relationship between touchscreen tablet usage time and attention performance in young children. *Journal of Research on Technology in Education, 54*(2), 317–326. DOI https://doi.org/10.1080/15391523.2021.1891995

Kalyuga, S., & Plass, J. L. (2009). Evaluating and Managing Cognitive Load in Games. In R. E. Ferdig (Ed.), *Handbook of Research on Effective Electronic Gaming in Education* (pp. 719–737). Hershey.

Kardefelt-Winther, D. (2014). A conceptual and methodological critique of internet addiction research: Towards a model of compensatory internet use. *Computers in Human Behavior, 31*(1), 351–354. DOI https://doi.org/10.1016/j.chb.2013.10.059

Kim, S.-C., & Lee, H. (2025). An Analysis of the Impact of Digital Therapeutic Interventions on Attention and Working Memory in Children with Attention-Deficit/Hyperactivity Disorder: A Randomized Controlled Trial. Applied *Sciences, 15*(2), 788. DOI https://doi.org/10.3390/app15020788

Király, O., Koncz, P., Griffiths, M. D., & Demetrovics, Z. (2023). Gaming disorder: A summary of its characteristics and aetiology. Comprehensive *Psychiatry, 122*(9), 152376. DOI https://doi.org/10.1016/j.comppsych.2023.152376

Konok, V., Bunford, N., & Miklósi, Á. (2020). Associations between child mobile use and digital parenting style in Hungarian families. *Journal of Children and Media, 14*(1), 91–109. DOI https://doi.org/10.1080/17482798.2019.1684332

Konok, V., Liszkai-Peres, K., Bunford, N., Ferdinandy, B., Jurányi, Z., Ujfalussy, D. J., Réti, Z., Pogány, Á., Kampis, G., & Miklósi, Á. (2021). Mobile use induces local attentional precedence and is associated with limited socio-cognitive skills in preschoolers. *Computers in Human Behavior, 120*, 106758. DOI https://doi.org/10.1016/j.chb.2021.106758

Kousari, M., & Mehrabi, M. (2017). Parental Mediation of Children's Video Game Experiences: Iranian Parents' Strategies of Mediation. *LAU International Journal of Social Sciences, 7(*1), 1–14. http://noo.rs/3iZAd

Landhuis, C. E., Poulton, R., Welch, D., & Hancox, R. J. (2007). Does Childhood Television Viewing Lead to Attention Problems in Adolescence? *Results From a Prospective Longitudinal Study. Pediatrics, 120*(3), 532–537. DOI https://doi.org/10.1542/peds.2007-0978

Lau, P. W. C., Lau, E. Y., Wang, J. J., Choi, C., & Kim, C. G. (2017). A Pilot Study of the Attractive Features of Active Videogames Among Chinese Primary School Children. *Games for Health Journal, 6*(2), 87–96. DOI https://doi.org/10.1089/g4h.2016.0021

Lee, D., Lee, J., Lee, J. E., & Jung, Y.-C. (2017). Altered functional connectivity in default mode network in Internet gaming disorder: Influence of childhood ADHD. Progress in *Neuro-Psychopharmacology and Biological Psychiatry, 75*, 135–141. DOI https://doi.org/10.1016/j.pnpbp.2017.02.005

Levine, L. E., Waite, B. M., & Bowman, L. L. (2007). Electronic Media Use, Reading, and Academic Distractibility in College Youth. *CyberPsychology & Behavior, 10*(4), 560–566. DOI https://doi.org/10.1089/cpb.2007.9990

Levine, L. E., Waite, B. M., Bowman, L. L., & Kachinsky, K. (2019). Mobile media use by infants and toddlers. *Computers in Human Behavior, 94*(January), 92–99. DOI https://doi.org/10.1016/j.chb.2018.12.045

Li, H., Subrahmanyam, K., Bai, X., Xie, X., & Liu, T. (2018). Viewing Fantastical Events Versus Touching Fantastical Events: Short-Term Effects on Children's Inhibitory Control. *Child Development, 89*(1), 48–57. DOI https://doi.org/10.1111/cdev.12820

Liau, A. K., Choo, H., Li, D., Gentile, D. A., Sim, T., & Khoo, A. (2015). Pathological video-gaming among youth: A prospective study examining dynamic protective factors. *Addiction Research & Theory, 23*(4), 301–308. DOI https://doi.org/10.3109/16066359.2014.987759

Liu, X., Liao, M., & Dou, D. (2019). Video Game Playing Enhances Young Children's Inhibitory Control. Lecture Notes in Computer Science 11595 LNCS (Issue June 2019), 141–153. DOI https://doi.org/10.1007/978-3-030-22602-2_12

Lucas, K., & Sherry, J. L. (2004). Sex Differences in Video Game Play: Communication *Research, 31*(5), 499–523. DOI https://doi.org/10.1177/0093650204267930

Mackey, A. P., Hill, S. S., Stone, S. I., & Bunge, S. A. (2011). Differential effects of reasoning and speed training in children. *Developmental Science, 14*(3), 582–590. DOI https://doi.org/10.1111/j.1467-7687.2010.01005.x

Masi, L., Abadie, P., Herba, C., Emond, M., Gingras, M. P., & Amor, L. Ben. (2021). Video Games in ADHD and Non-ADHD Children: Modalities of Use and Association With ADHD *Symptoms. Frontiers in Pediatrics, 9*(March), 1–10. DOI https://doi.org/10.3389/fped.2021.632272

Mayer, R. E. (2014). *Computer Games for Learning: An Evidence-Based Approach*. The MIT Press.

Merrill, E. C., & Lookadoo, R. (2004). Selective search for conjunctively defined targets by children and young adults. *Journal of Experimental Child Psychology, 89*(1), 72–90. DOI https://doi.org/10.1016/j.jecp.2004.04.001

Misirli, A., Komis, V., & Ravanis, K. (2019). The construction of spatial awareness in early childhood: the effect of an educational scenario-based programming environment. Review of Science*, Mathematics and ICT Education, 13*(1), 111–124. DOI https://doi.org/10.26220/rev.3122

Monteiro, C., Lemos, A., & Kochhann, A. (2023). Cognition and Metacognition Development Through the Use of Educational Games: Expected Behaviors and Developed Behaviors. *Concilium, 23*(17), 747–760. DOI https://doi.org/10.53660/CLM-2157-23Q08

Moyano, S., Conejero, Á., Fernández, M., Serrano, F., & Rueda, M. R. (2022). Development of visual attention control in early childhood: Associations with temperament and home environment. *Frontiers in Psychology, 13*, 1–18. DOI https://doi.org/10.3389/fpsyg.2022.1069478

Moyano, S., Rico-Picó, J., Conejero, Á., Hoyo, Á., Ballesteros-Duperón, M. de los Á., & Rueda, M. R. (2023). Influence of the environment on the early development of attentional control. *Infant Behavior and Development, 71*, 101842. DOI https://doi.org/10.1016/j.infbeh.2023.101842

Oakes, L. M. (2023). The Cascading Development of Visual Attention in Infancy: Learning to Look and Looking to Learn. *Current Directions in Psychological Science, 32*(5), 410–417. DOI https://doi.org/10.1177/09637214231178744

Ofcom. (2024). *Children and Parents: Media Use and Attitudes Report*. In Ofcom (Issue April).

Ólafsdóttir, I. M., Kristjánsson, T., Gestsdóttir, S., Jóhannesson, Ó. I., & Kristjánsson, Á. (2016). Understanding visual attention in childhood: Insights from a new visual foraging task. *Cognitive Research: Principles and Implications, 1*(1), 18. DOI https://doi.org/10.1186/s41235-016-0016-5

Pakai-Stecina, D. T., & Zsidó, N. A. (2023). A vizuális tulajdonságok mentén kiugró ingerek hatása az inger- és célvezérelt figyelmi folyamatokra: szisztematikus áttekintés. *Magyar Pszichológiai Szemle, 78*(3), 375–407. DOI https://doi.org/10.1556/0016.2023.00047

Passig, D., & Eden, S. (2001). Virtual Reality as a Tool for Improving Spatial Rotation among Deaf and Hard-of-Hearing Children. *CyberPsychology & Behavior, 4*(6), 681–686. DOI https://doi.org/10.1089/109493101753376623

Paulus, F. W., Sinzig, J., Mayer, H., Weber, M., & von Gontard, A. (2018). Computer Gaming Disorder and ADHD in Young Children–a Population-Based Study. *International Journal of Mental Health and Addiction, 16*(5), 1193–1207. DOI https://doi.org/10.1007/s11469-017-9841-0

Portugal, A. M., Bedford, R., Cheung, C. H. M., Mason, L., & Smith, T. J. (2021). Longitudinal touchscreen use across early development is associated with faster exogenous and reduced endogenous attention control. *Scientific Reports, 11*(1), 2205. DOI https://doi.org/10.1038/s41598-021-81775-7

Portugal, A. M., Hendry, A., Smith, T. J., & Bedford, R. (2023). Do pre-schoolers with high touchscreen use show executive function differences? *Computers in Human Behavior, 139*, 107553. DOI https://doi.org/10.1016/j.chb.2022.107553

Powers, K. L., Brooks, P. J., Aldrich, N. J., Palladino, M. A., & Alfieri, L. (2013). Effects of video-game play on information processing: A meta-analytic investigation. *Psychonomic Bulletin & Review, 20*(6), 1055–1079. DOI https://doi.org/10.3758/s13423-013-0418-z

Pujol, J., Fenoll, R., Forns, J., Harrison, B. J., Martínez-Vilavella, G., Macià, D., Alvarez-Pedrerol, M., Blanco-Hinojo, L., González-Ortiz, S., Deus, J., & Sunyer, J. (2016). Video gaming in school children: How much is enough? *Annals of Neurology, 80*(3), 424–433. DOI https://doi.org/10.1002/ana.24745

Reck, S. G., & Hund, A. M. (2011). Sustained attention and age predict inhibitory control during early childhood. *Journal of Experimental Child Psychology, 108*(3), 504–512. DOI https://doi.org/10.1016/j.jecp.2010.07.010

Richards, J. E. (1988). Heart Rate Offset Responses to Visual Stimuli in Infants from 14 to 26 Weeks of Age. *Psychophysiology, 25*(3), 278–291. DOI https://doi.org/10.1111/j.1469-8986.1988.tb01243.x

Rideout, V., & Robb, M. B. (2020). *The Common Sense census: Media use by kids age zero to eight, 2020*. San Francisco, CA: Common Sense Media.

Rocha, B., & Nunes, C. (2020). Benefits and damages of the use of touchscreen devices for the development and behavior of children under 5 years old–a systematic review. *Psicologia: Reflexão e Crítica, 33*(1), 24. DOI https://doi.org/10.1186/s41155-020-00163-8

Rueda, M. R., Rothbart, M. K., McCandliss, B. D., Saccomanno, L., & Posner, M. I. (2005). Training, maturation, and genetic influences on the development of executive

attention. *Proceedings of the National Academy of Sciences, 102*(41), 14931–14936. DOI https://doi.org/10.1073/pnas.0506897102

Rütsche, A., Baumann, A., Jiang, X., & Mojon, D. S. (2006). Development of visual pursuit in the first 6 years of life. *Graefe's Archive for Clinical and Experimental Ophthalmology, 244*(11), 1406–1411. DOI https://doi.org/10.1007/s00417-005-0248-4

Sampalo, M., Lázaro, E., & Luna, P.-M. (2023). Action Video Gaming and Attention in Young Adults: A Systematic Review. *Journal of Attention Disorders, 27*(5), 530–538. DOI https://doi.org/10.1177/10870547231153878

Samson, A. D., Rohr, C. S., Park, S., Arora, A., Ip, A., Tansey, R., Comessotti, T., Madigan, S., Dewey, D., & Bray, S. (2021). Videogame exposure positively associates with selective attention in a cross-sectional sample of young children. *PLOS ONE, 16*(9), e0257877. DOI https://doi.org/10.1371/journal.pone.0257877

Sauce, B., Liebherr, M., Judd, N., & Klingberg, T. (2022). The impact of digital media on children's intelligence while controlling for genetic differences in cognition and socioeconomic background. *Scientific Reports, 12*(1), 7720. DOI https://doi.org/10.1038/s41598-022-11341-2

Simons, D. J., Boot, W. R., Charness, N., Gathercole, S. E., Chabris, C. F., Hambrick, D. Z., & Stine-Morrow, E. A. L. (2016). Do "Brain-Training" Programs Work? *Psychological Science in the Public Interest, 17*(3), 103–186. DOI https://doi.org/10.1177/1529100616661983

Soldatova, G., Vishneva, A., & Koshevaya, A. (2022). Neuro-cognitive features of children and adolescents with different levels of multitasking. *European Psychiatry, 65*(S1), S273–S273. DOI https://doi.org/10.1192/j.eurpsy.2022.699

Steenbergen, L., Sellaro, R., Stock, A.-K., Beste, C., & Colzato, L. S. (2015). Action Video Gaming and Cognitive Control: Playing First Person Shooter Games Is Associated with Improved Action Cascading but Not Inhibition. *PLOS ONE, 10*(12), e0144364. DOI https://doi.org/10.1371/journal.pone.0144364

Sun, L., Francis, D. J., Nagai, Y., & Yoshida, H. (2024). Early development of saliency-driven attention through object manipulation. *Acta Psychologica, 243*, 104124. DOI https://doi.org/10.1016/j.actpsy.2024.104124

Suziedelyte, A. (2012). Can Video Games Affect Children's Cognitive and Non-Cognitive Skills? *UNSW Australian School of Business Research Paper, No. 2012 E* DOI https://doi.org/10.2139/ssrn.2140983

Tahiroglu, A. Y., Celik, G. G., Avci, A., Seydaoglu, G., Uzel, M., & Altunbas, H. (2010). Short-Term Effects of Playing Computer Games on Attention. *Journal of Attention Disorders, 13*(6), 668–676. DOI https://doi.org/10.1177/1087054709347205

Talalay, I. V. (2024). The development of sustained, selective, and divided attention in school-age children. *Psychology in the Schools, 61*(6), 2223–2239. DOI https://doi.org/10.1002/pits.23160

Tan, L. H., & Xu, M. (2020). Reading development in the digital age. *Human Behaviour and Brain, 1*, 71–73. DOI https://doi.org/10.37716/HBAB.2020010402

Trick, L. M., Jaspers-Fayer, F., & Sethi, N. (2005). Multiple-object tracking in children: The "Catch the Spies" task. *Cognitive Development, 20*(3), 373–387. DOI https://doi.org/10.1016/j.cogdev.2005.05.009

Trisolini, D. C., Petilli, M. A., & Daini, R. (2018). Is action video gaming related to sustained attention of adolescents? *Quarterly Journal of Experimental Psychology, 71*(5), 1033–1039. DOI https://doi.org/10.1080/17470218.2017.1310912

Turoman, N., Tivadar, R. I., Retsa, C., Maillard, A. M., Scerif, G., & Matusz, P. J. (2021). The development of attentional control mechanisms in multisensory environments. *Developmental Cognitive Neuroscience, 48*, 100930. DOI https://doi.org/10.1016/j.dcn.2021.100930

Vashisht, V., & Navqi, H. (2024). The Impact of Video Games on Attention Span and Working Memory Retention in Underprivileged Adolescents: Preliminary Findings (Preprint). *JMIR Preprints, 28*/10/2024. DOI https://doi.org/10.2196/preprints.68080

Virgilio, R. de L. Á. (2024). The Cognition-Impairing Effect of Video Games in Adolescents. *Science Insights, 44*(3), 1283–1289. DOI https://doi.org/10.15354/si.24.re935

Weber, R., Tamborini, R., Westcott-Baker, A., & Kantor, B. (2009). Theorizing Flow and Media Enjoyment as Cognitive Synchronization of Attentional and Reward Networks. *Communication Theory, 19*(4), 397–422. DOI https://doi.org/10.1111/j.1468-2885.2009.01352.x

Welker, K. M. (2022). Video Games—Cognitive Help or Hindrance? *JAMA Network Open, 5*(10), e2235729.DOI https://doi.org/10.1001/jamanetworkopen.2022.35729

Werchan, D. M., Brandes-Aitken, A., Ku, S., & Blair, C. (2025). Naturalistic patterns of sustained attention across early childhood: Developmental profiles and longitudinal associations with executive functions. *Developmental Psychology, 61*(5), 944–956. DOI https://doi.org/10.1037/dev0001786

West, R., Swing, E. L., Anderson, C. A., & Prot, S. (2020). The Contrasting Effects of an Action Video Game on Visuo-Spatial Processing and Proactive Cognitive Control. International *Journal of Environmental Research and Public Health, 17*(14), 5160. DOI https://doi.org/10.3390/ijerph17145160

Yu, J., DeVore, A., & Roque, R. (2021). Parental mediation for young children's use of educational media: A case study

with computational toys and kits. *Conference on Human Factors in Computing Systems - Proceedings*, 1–12. DOI https://doi.org/10.1145/3411764.3445427

Yuji, H. (1996). Computer Games and Information-Processing Skills. *Perceptual and Motor Skills, 83*(2), 643–647. DOI https://doi.org/10.2466/pms.1996.83.2.643

Zaman, B., & Abeele, V. Vanden. (2007). Towards a likeability framework that meets child-computer interaction & amp; communication sciences. Proceedings of the 6th International Conference on Interaction *Design and Children*, 1–8. DOI https://doi.org/10.1145/1297277.1297279

Zioga, T., Nega, C., Roussos, P., & Kourtesis, P. (2024). Validation of the Gaming Skills Questionnaire in Adolescence: Effects of Gaming Skills on Cognitive and Affective Functioning. *European Journal of Investigation in Health, Psychology and Education, 14*(3), 722–752. DOI https://doi.org/10.3390/ejihpe14030048