

Parent-Perceived Child Development in Preschoolers Engaging in Play that Includes Physical Activity

Rodrigo Gallardo-Rodríguez^{1,*}, Laura Léniz-Maturana², Karen Gallardo-Rodríguez³,
Héctor Hidalgo-Pérez⁴

¹Department of Sport Science and Physical Conditioning, Faculty of Education, Universidad Católica de la Santísima Concepción, Chile

²Independent Researcher, Concepción, 4030000, Biobío, Chile

³School of Pedagogy, Faculty of Philosophy and Education, Pontificia Universidad Católica de Valparaíso, Chile

⁴Faculty of Engineering, Universidad Finis Terrae, Chile

Received February 23, 2023; Revised May 16, 2023; Accepted June 11, 2023

Cite This Paper in the Following Citation Styles

(a): [1] Rodrigo Gallardo-Rodríguez, Laura Léniz-Maturana, Karen Gallardo-Rodríguez, Héctor Hidalgo-Pérez, "Parent-Perceived Child Development in Preschoolers Engaging in Play that Includes Physical Activity," *International Journal of Human Movement and Sports Sciences*, Vol. 11, No. 4, pp. 803 - 811, 2023. DOI: 10.13189/saj.2023.110414.

(b): Rodrigo Gallardo-Rodríguez, Laura Léniz-Maturana, Karen Gallardo-Rodríguez, Héctor Hidalgo-Pérez (2023). *Parent-Perceived Child Development in Preschoolers Engaging in Play that Includes Physical Activity*. *International Journal of Human Movement and Sports Sciences*, 11(4), 803 - 811. DOI: 10.13189/saj.2023.110414.

Copyright©2023 by authors, all rights reserved. Authors agree that this article remains permanently open access under the terms of the Creative Commons Attribution License 4.0 International License

Abstract Physical activity can influence cognitive, linguistic, and emotional development from an early age in a positive way, emphasizing the importance of play in the daily activities of children. The aim was to describe the association between the weekly time spent by preschoolers in games that included physical activity and their child development, comparing that development when the game was played in the company of others. Fifty Chilean preschoolers with typically normative development (51.20 ± 9.92 months) participated. Sociodemographic data were collected employing an ad-hoc questionnaire. Parents recorded the types of games their children played for one week, the time spent, and with whom they played them. Finally, the Ages and Stages Questionnaire 3rd edition and socioemotional (ASQ-3 and ASQ-SE) were applied to assess child development in different areas. Those preschoolers who spent more time playing with weekly physical activity had higher scores in the communication area that included expressive and comprehensive communication ($p=0.01$), emotional communication ($p\leq 0.05$), socio-individual development ($p=0.001$), and adaptive functioning ($p\leq 0.05$). Likewise, children who performed plays that included physical activity with nearby adults showed higher scores in ASQ-SE adaptive functioning area ($p\leq 0.05$). The frequency of active play employed by preschoolers seems to influence different areas

of child development associated with social factors.

Keywords Child Development, Physical Activity, Play, Preschool

1. Introduction

The frequency and timing of physical activity contribute to establishing an active lifestyle over time [1,2], promoting better child motor, cognitive and linguistic development [3-5]. Physical activity positively affects locomotion activities [6], which, together with stability and manipulative movements, influence children's physical, social, and cognitive development [7]. The above could be because motor coordination is positively associated with the amount of physical activity performed [8]. A significant relationship exists between body movement language skills and social interactions [9]. It is also known that body movement is often performed in the company of other individuals, especially during childhood, because it is linked to play, providing benefits for the child in his or her social and emotional development, which could explain the relationship between movement and social interactions [10]. Active play involving vigorous movement is

associated with a more optimal level of child development. [11]. Specifically, preschoolers who engage in group physical activities have more effective social skills and fewer internalizing and externalizing behavioral problems [12]. In addition, the time spent in physical activity by children and preadolescents may be fundamental in their socio-emotional development. This is consistent with the study by García-Hermoso et al. [13], who indicated that children who reported less physical activity had a lower level of satisfaction with life and less affection, that is, less pleasurable experiences of emotions. It has also been found that there is a significant association between a high level of motor skills and low anxiety [14]. Specifically, body movement is essential in psychosocial development since age-appropriate coordination ability promotes well-being and satisfaction in the individual [15]. Hence, a higher level of physical activity improves academic behavior and self-esteem in children [16]. Movement in the first years of life is critical. Mavilidi et al. [17] found that preschoolers who integrated physical exercise into their learning performed better in different areas of their life than those who did not. Older children's math and language performance improved when they engaged in more physical activity [18]. In addition, play that includes limb movements and displacements usually takes place in open spaces, demonstrating that those children who play in larger places have better locomotor skills than those who play in smaller spaces [19]. Likewise, it has been shown that children who play and perform physical activities outdoors have better motor development compared to those who do not [20]. Physical activity is related to children's gross motor skills [21], which improve according to the time and quality of stimuli and the maturation of the nervous and musculoskeletal systems [8]. From this point of view, it is necessary to emphasize the relevance of developing these skills through play since they are present in most physical activities, contributing to the acquisition of other skills that are not only related to gross motor skills. It is essential to promote physical activity from a playful perspective [22]. The confinement due to the COVID-19 pandemic has caused the time dedicated to physical activity in Chilean children to decrease, increasing the duration of sleep and decreasing its quality [23]. Unfortunately, the abovementioned factors could interfere with the child's development, affecting the skills expected according to their chronological age. Children and adolescents mainly engage in physical activity through vigorous play [24]. Therefore, there is a close association between physical activity and active play. Moreover, play is a fundamental activity for optimal child development. In a sample of Chilean children, it has recently been shown that promoting play improves different areas of child development, such as language, cognition, and social development [25]. Evidence shows that children's physical activity and play are closely related [26]. This research aimed to describe the relationship between the weekly time spent by children aged 33 to 65 months in games that include physical

activity and their level of child development. In this line, it is hypothesized that a more significant amount of weekly time spent by children in games that include physical activity would be related to better cognitive, linguistic, motor, socio-individual, and socio-emotional development.

2. Materials and Methods

2.1. Design

A quantitative methodological approach was used to respond to the stated objective. The design corresponds to a descriptive one by applying a closed-question questionnaire. The information obtained from the data showed the parents' answers regarding the children's behaviors, in which there was no intervention by the researchers. Likewise, the data from the individuals were collected only once at a specific time.

2.2. Subjects

A total of 50 preschoolers (boys: $n=31$; 62%. girls: $n=19$; 38%) aged between 33 and 65 months (51.20 ± 9.92) residing in different communes of Chile, mainly from the Biobío Region participated in this research, given that it has been observed that in this location, it is necessary that when children reach the school stage, campaigns are implemented to promote physical activity that contributes to their integral development due to the prevalence of overweight and low academic performance caused by physical inactivity. Schoolchildren participating and not participating in a school integration program of a public educational establishment in the province of Biobío (Chile) have similar nutritional status, physical condition, and academic performance. [27]

The families were recruited in a non-probabilistic sample during May and June 2022. Using the snowball technique, those selected helped by recruiting new participants among their acquaintances to collaborate with the research. Children with intellectual or motor disabilities reported by their parents were excluded from the sample. All participants were informed of the purposes and contents of the study. This research followed the Declaration of Helsinki (1964 and subsequent updates) [28]. Informed consent was obtained.

2.3. Instruments

2.3.1. Sociodemographic Variables

A questionnaire was applied to the mothers and fathers to obtain relevant information on the children's data regarding date of birth, sex, commune of residence, and whether there was any developmental or health problem. This last variable was used as an exclusion criterion to comply with the sample characteristics required in this research. In addition, parents were asked to record for one

week the types of games their children played, the time spent playing, and with whom they played these games; specifically, they were asked to detail whether they played these games alone, in the company of other children or the company of significant adults (parents or caregivers). Only active games were considered (running, jumping, throwing objects, such as a ball or playing outdoors, etc.), discarding passive games (symbolic, with tablets, cell phones, technology, etc.).

2.3.2. Child Development

Ages and Stages Questionnaire (ASQ-3) [29]: A written report questionnaire answered by mothers and fathers that assesses the developmental level of children from birth to 66 months considering the dimensions of communication (i.e., language development); motor skills, both fine and gross (referred to proximal movements of big muscles such as arms and legs, and coordination of distal muscles such as fingers), problem-solving (cognitive abilities), and personal-social skills (it includes socialization). The scale is composed of 6 items per domain, which are coded, obtaining values of 10 points (yes), 5 points (sometimes), or 0 points (not yet), depending on whether or not the child can achieve the activity indicated in the item. The sum of the indicators determines the total score for each area. There are cut-off scores for each age range that differ from each other to establish whether children have an average level of development according to their age. The instrument was considered a valid and reliable measure to assess child development, as demonstrated by the overall sensitivity of 0.86, specificity of 0.85, 86% agreement with other standardized instruments, and internal consistency between 0.51 and 0.87 [29]. In addition, validity is demonstrated in urban, ethnic minority, and low-income populations [30, 31]. In this study, Cronbach's alpha was 0.76.

Ages and Stages Questionnaire-Social-Emotional (ASQ-SE) [32]: Questionnaire to measure child socio-emotional development problems. The indicators aim to assess the dimensions of self-regulation (child's ability to calm down), compliance (following rules and instructions), adaptive functioning (associated with physiological needs), autonomy (taking the initiative in different situations), affect (ability to show feelings and empathy), social communication (child's ability to express his or her needs), and interaction (ability to respond to others when socializing). Scores were assigned according to mothers' and fathers' responses. Like ASQ-3, this instrument has cut-off scores for each age range. However, the higher the score, the lower the level of socio-emotional development. This instrument has demonstrated reliability ranging from 0.71 to 0.91 [32], which for this sample was moderate ($\alpha=0.68$).

2.4. Procedure

Mothers and fathers whose children attended an educational center that served preschoolers from 2 to 6 years of age in the city of Concepción, Chile, were contacted. We explained the study and asked them to contact people they knew who met the established criteria to participate in the research. Participants were contacted by e-mail, informing them of the research objective using an information sheet explaining how they would contribute to the study, the risks and benefits of participating, and that their involvement would be voluntary and confidential. Those who agreed to participate in the research received the corresponding questionnaires. All questionnaires were requested to be answered jointly by the father and mother, except for those children who did not have a father or mother figure present. In those cases, the father or mother answered the questionnaire only. Questionnaires were answered based on the reports by parents of their children's activities.

2.5. Statistical Analysis

First, the scores of each area obtained by the children in ASQ-3 and ASQ-SE were transformed into standardized Z scores to homogenize the cut-off scores according to the age ranges established in those instruments. Therefore, the data automatically fall into a distribution with a mean of 0 and a standard deviation of 1 [33]. Then, the normality of the data distribution was determined using the Kolmogorov-Smirnov test, which showed that all areas of child development met the criterion of normal distribution except for the autonomy and fine motor skills items. Considering that Z-scores transform the values into a normal distribution, the association between active play time and the child development area scores was calculated using Pearson correlation.

Subsequently, the mean differences in the scores of the child development areas were compared according to who accompanied the children in the active games recorded using Student's t-test.

The significance level was established as $p \leq 0.05$. Statistical analyses were performed in SPSS 27 for Windows.

3. Results

Table 1 shows the influence of spending more time in active games during one week on the children's level of development. The analyses carried out show significance in that the more time spent in active play, the children show fewer problems in social communication ($r=-0.328$; $p=0.020$), fewer problems in adaptive functioning ($r=-0.288$; $p=0.042$), better development in comprehension and expressive communication ($r=0.360$; $p=0.010$) and better socio-individual development ($r=0.450$; $p=0.001$).

Table 1. Correlations between ASQ-3 and ASQ-SE items with weekly playtime.

ASQ-SE / ASQ-3 items	Weekly play time	
	r	p
ASQ-SE		
Self-regulation	0.061	0.674
Adaptive functioning	-0.288	0.042*
Affect	0.047	0.745
Social communication	-0.328	0.020 [†]
Interaction	0.051	0.726
Autonomy	0.081	0.576
Compliance	-0.167	0.245
ASQ-3		
Communication	0.360	0.010**
Gross motor skills	0.089	0.539
Fine motor skills	0.078	0.591
Problem solving	0.199	0.166
Socio-individual	0.450	0.001 [†]

*p≤0.05 **p≤0.01 †p≤0.005

Table 2. Values of ASQ-3 and ASQ-SE items as a function of the presence of other individuals in children's active play.

	Play alone		Play with other children		Play with significant adults	
	MD	p	MD	p	MD	p
ASQ-SE						
Self-regulation	-0.719	0.159	-0.455	0.093	-0.482	0.072
Adaptive functioning	-0.411	0.372	-0.156	0.535	-0.487	0.017*
Affect	-0.754	0.137	-0.018	0.949	-0.478	0.094
Social communication	-0.261	0.621	-0.055	0.849	-0.117	0.695
Interaction	-0.114	0.829	0.149	0.603	0.182	0.540
Autonomy	-0.119	0.809	-0.089	0.741	-0.066	0.813
Compliance	-0.194	0.698	-0.026	0.925	0.246	0.384
ASQ-3						
Communication	-0.459	0.380	0.289	0.308	-0.446	0.128
Gross motor	-0.393	0.655	-0.048	0.866	-0.109	0.712
Fine motor	0.424	0.417	0.516	0.066	-0.051	0.862
Problem solving	0.481	0.358	0.289	0.309	0.163	0.582
Personal-social	-0.268	0.607	0.297	0.294	-0.154	0.602

MD: mean difference. *p≤0.05

Regarding the difference between child development and whether they participated in active play alone, in the company of other children and other adults, the results showed statistically significant differences only in adaptive functioning when children participated in active play in the company of significant adults ($p=0.02$; $MD=-0.49$) as shown in Table 2.

4. Discussion

This study showed that preschoolers who spent more time per week in active games presented better social communication and greater independence than children who spent less time during the week in such games. The aforementioned is consistent with the study by Sanders et al. [34], where greater autonomy in the choice of physical activity options increased children's participation in physical activity. Regarding social communication, the children who presented more problems were shown to be those who spent less time in active play. In agreement with those findings, Shablack et al. [35] indicate that children's ability to communicate emotions and ideas depends on the environments in which they express themselves. The aforementioned reaffirms the importance of consistent physical activity in preschoolers since early childhood is a sensitive period where personal and family habits are prone to change and adaptation [36]. Specifically in this study, of the areas measured by ASQ-3 and ASQ-SE, it was found that the frequency of active play was associated with communication (language skills), personal-social (i.e., autonomy and the child's ability to socialize with others), social communication (ability to communicate emotions) and adaptive functioning (referring to physiological needs such as sleep and feeding). It is well known that healthy habits such as movement, as opposed to inactivity and screen time, can promote a better level of development in language and physiological functions in children [37]. Likewise, one critical factor that generates the need for children to be autonomous is the motivation to be physically active [38]. From this perspective, it is reasonable that more play time involving physical activity is associated with communication, social, and autonomy skills.

Current research that has been conducted with children under six years of age, both with normative development and those with special educational needs, has shown that language skills were associated with physical activity [39-41] and has also proven the positive influence of physical activity on cognitive functions [42]. Likewise, there is a strong relationship between the frequency of active play and gross motor development [8]. The results of this study differ from those recently reported. This fact could be because the sample of this study is small. The time measurement in other studies is usually done with accelerometers [43, 44], having a more accurate measurement of the time of physical activity performed by

children. Despite this, expressive and comprehensive language and active play were associated. In addition, in the findings of another study conducted by Jiménez and Araya [45], a movement promotion program in preschoolers was associated with better gross motor development but not with better cognitive or linguistic development. Hence, the results are partially similar to those of this study.

Adequate child development involves better cognitive control, emotional expressiveness, and greater empathy and emotional regulation [46]. In addition, promoting autonomy and independence in the preschool stage contributes to children being able to solve problems and have better social skills. Suppose physical activity fosters full development in terms of emotional language and socio-individual development. In that case, it is essential to encourage children to play active games as much as possible from a very early age. In addition, evidence affirms that games are essential since play activities are linked to motor fluency and flexibility movement during the infant stage is one of the primary means of action, expression, and learning [47], so it is relevant that responsible adults encourage children to play motor games for better child development [48].

The results of this study also showed that those children who spent more time in active play and who did so in the company of significant adults had better adaptive functioning, which is associated with physiological needs such as hunger and sleep. This finding is supported by a study by Efraim et al. [49], who indicated that active play, as opposed to a sedentary lifestyle, promotes children to have better hunger control. Likewise, a meta-analysis showed that physical activity and outdoor play were favorably associated with sleep quality, quantity, and efficiency in children under five years of age [50]. The children who showed better adaptive functioning when they engaged in active play in the company of significant adults could be because, as children grow, several variables influence a more significant amount of movement, including parental role modeling [51].

However, unlike what has been reported in previous studies on the association between active play and cognitive development, which in ASQ-3 was measured as problem-solving and motor development, as well as other areas of socio-emotional development such as self-regulation, affect, and compliance that were measured with ASQ-SE, our results did not find a significant association between active play and these areas of child development. Some research that has assessed early child development has found that sociodemographic variables and parental factors, such as quality of dyadic interaction and parental emotional well-being, influence children's cognitive and socioemotional development [52-54]. Likewise, parents have been found to influence the physical activity of their preschool children [55]. Furthermore, as noted in the introduction, higher physical activity levels are associated with children's motor development. [56]. However, these

variables were not measured in this research, so future studies analyzing this topic must consider family variables, both sociodemographic and parental behaviors.

The importance of the naturalness of play with movement from early childhood can explain the results found in this study. Parents who reported that games involving more vigorous activities, such as running and jumping, which are typical in open spaces, also indicated that their children's social, autonomy, and communication skills were better. These results are supported by the study conducted by Veitch et al. [57], who indicated that parents considered active play in the playground essential and included implements such as a ball in the games, which they considered to promote their children's independence.

In summary, this research shows that active play participation is associated with optimal development and improved physical, social, and mental health that can contribute to a child's future physical fitness. According to Myer et al. [58], children who do not regularly participate in structured motor skill enrichment activities are likely to reduce their chance of reaching the genetic potential for control of such skill, which is the basis for sustainable physical fitness later in life.

5. Conclusions

The results of this study show that the amount of time preschoolers spend in active play appears to influence various components of child development. Play activities that included body movement were primarily linked to higher levels of communication, which is a child development area that was assessed with ASQ-3 and, more specifically, social communication development (area of ASQ-SE). This is a significant result, as it adds information to the literature that has affirmed that physical activity helps in communication and social skills in children with difficulties in this area [59]. Children's social-individual development and adaptive functioning were also related to time spent in active play. These findings reinforce that physical activity from an early age is critical to a child's development. This includes the ability to perform actions by oneself and to function with others, considering play activities as a natural social process in human beings.

As limitations, we highlight that the estimation of the time spent playing games did not contemplate the joint use of any instrument for measuring physical activity, so the results do not reflect other aspects, such as intensity and fluctuations in the declared play activities. It should be noted, however, that in an investigation by Jiménez et al. [60], the amount of time for movement activities performed by the children was analyzed based on what was reported by the parents. Rothbart and Bates [61] indicate that when caregivers evaluate their children, it can be positive since they know their children better and can give answers that an evaluator does not always observe at a given time, primarily when they evaluate socioemotional dimensions,

which are similar to the results of this study that showed an association between active play and social and emotional variables. From this point of view, conducting research that includes evaluations considering both visions is suggested to obtain a complete view of child development. It is advisable to carry out studies whose methodology contemplates using instruments such as accelerometers that allow obtaining objective data regarding the time and intensity of play performed by children.

The findings of this study contribute to the knowledge about the importance of physical activity as part of play. From this perspective, it is essential to promote policies and instances of more time spent playing active games in preschools. Likewise, parents must encourage their children to go to public spaces to create opportunities for games whose primary focus is movement.

REFERENCES

- [1] Bell, L., Fletcher, E., Timperio, A., Vuillermin, P., & Hesketh, K., "Preschool children's physical activity and cardiovascular disease risk: A systematic review," *Journal of science and medicine in sport*, vol. 22, no. 5, pp. 568–573, 2019, DOI: 10.1016/j.jsams.2018.11.021.
- [2] Jones, R., Hinkley, T., Okely, A., & Salmon, J., "Tracking physical activity and sedentary behavior in childhood: a systematic review," *American journal of preventive medicine*, vol. 44, no. 6, pp. 651-658, 2013, DOI: 10.1016/j.amepre.2013.03.001.
- [3] Carson, V., Lee, E., Hewitt, L., Jennings, C., Hunter, S., Kuzik, N., ... & Tremblay, M. S., "Systematic review of the relationships between physical activity and health indicators in the early years (0-4 years)," *BMC public health*, vol. 17, no. 5, pp. 33-63, 2017, DOI: 10.1186/s12889-017-4860-0.
- [4] Veldman, S., Paw, M., & Altenburg, T., "Physical activity and prospective associations with indicators of health and development in children aged < 5 years: a systematic review," *International Journal of Behavioral Nutrition and Physical Activity*, vol. 18, no. 1, pp. 1-11, 2021, DOI: 10.1186/s12966-020-01072-w.
- [5] Zeng, N., Ayyub, M., Sun, H., Wen, X., Xiang, P., & Gao, Z., "Effects of physical activity on motor skills and cognitive development in early childhood: a systematic review," *BioMed research international*, pp. 1-13, 2017, DOI: 10.1155/2017/2760716.
- [6] Wang, J., "A study on gross motor skills of preschool children," *Journal of Research in Childhood Education*, vol. 19, no. 1, pp. 32-43, 2004, DOI: 10.1080/02568540409595052.
- [7] Iivonen, S., & Sääkslahti, A., "Preschool children's fundamental motor skills: A review of significant determinants," *Early Child Development and Care*, vol. 184, no. 7, pp. 1107-1126, 2014, DOI: 10.1080/03004430.2013.837897.
- [8] Laukkanen, A., Pesola, A., Havu, M., Sääkslahti, A., & Finni, T., "Relationship between habitual physical activity

and gross motor skills is multifaceted in 5 to 8 year old children,” *Scandinavian Journal of Medicine and Science in Sports*, vol. 24, no. 2, pp. 102-110, 2014, DOI: 10.1111/sms.12116.

- [9] Leonard, H., & Hill, E. L., “Review: The impact of motor development on typical and atypical social cognition and language: A systematic review,” *Child and Adolescent Mental Health*, vol. 19, no. 3, pp. 163-170, 2014, DOI: 10.1111/camh.12055.
- [10] Burdette, H., & Whitaker, R., “Resurrecting Free Play in Young Children,” *Archives of Pediatrics & Adolescent Medicine*, vol. 159, no. 1, pp. 46, 2005, DOI: 10.1001/archpedi.159.1.46.
- [11] Felehi, S., Abedanzadeh, R., & Saemi, E., “Let them play” the effect of active play on motor proficiency and social maturity of children,” *Early Child Development and Care*, vol. 193, no. 2, pp. 201-210, 2023, DOI: 10.1080/03004430.2022.2074981.
- [12] Lobo, Y., & Winsler, A., “The effects of a creative dance and movement program on the social competence of head start preschoolers,” *Social Development*, vol. 15, no. 3, pp. 501-519, 2006, DOI: 10.1111/j.1467-9507.2006.00353.x.
- [13] Garc á-Hermoso, A., Hormazabal-Aguayo, I., Fernández-Vergara, O., Olivares, P. R., & Oriol-Granado, X., “Physical activity, screen time and subjective well-being among children,” *International Journal of Clinical and Health Psychology*, vol. 20, no. 2, pp. 126-134, 2020, DOI: 10.1016/j.ijchp.2020.03.001.
- [14] Veldman, S., Jones, R., & Okely, A., “Efficacy of gross motor skill interventions in young children: an updated systematic review,” *BMJ Open Sport & Exercise Medicine*, vol. 2, no. 1, pp. e000067, 2016, DOI: 10.1136/bmjsem-2015-000067.
- [15] Mancini, V., Rigoli, D., Cairney, J., Roberts, L., & Piek, J., “The Elaborated Environmental Stress Hypothesis as a Framework for Understanding the Association Between Motor Skills and Internalizing Problems: A Mini-Review,” *Frontiers in Psychology*, vol. 7, pp. 239, 2016, DOI: 10.3389/fpsyg.2016.00239.
- [16] Biddle, S., & Asare, M., “Physical activity and mental health in children and adolescents: A review of reviews,” *British Journal of Sports Medicine*, vol. 45, no. 11, pp. 886-895, 2011, DOI: 10.1136/bjsports-2011-090185.
- [17] Mavilidi, M., Okely, A., Chandler, P., Cliff, D., & Paas, F., “Effects of integrated physical exercises and gestures on preschool children’s foreign language vocabulary learning,” *Educational Psychology Review*, vol. 27, no. 3, pp. 413-426, 2015, DOI: 10.1007/s10648-015-9337-z.
- [18] Correa-Burrows, P., Burrows, R., Ibaceta, C., Orellana, Y., & Ivanovic, D., “Physically active Chilean school kids perform better in language and mathematics,” *Health Promotion International*, vol. 32, no. 2, pp. 241-249, 2017, DOI: 10.1093/heapro/dau010.
- [19] Chow, B., & Chan, L., “Gross Motor Skills of Hong Kong Preschool Children,” *Asian Journal of Physical Education & Recreation*, vol. 17, no. 1, pp. 71-77, 2011, DOI: 10.24112/ajper.171890.
- [20] Fjørtoft, I., “Landscape as Playscape: The Effects of Natural Environments on Children’s Play and Motor Development,” *Children Youth and Environments*, vol. 14, no. 2, pp. 21-44, 2004, http://www.stichtingoase.nl/literatuur/doc/doc_76.pdf.
- [21] Battaglia, G., Alesi, M., Tabacchi, G., Palma, A., & Bellafiore, M., “The Development of Motor and Pre-literacy Skills by a Physical Education Program in Preschool Children: A Non-randomized Pilot Trial,” *Frontiers in Psychology*, vol. 9, pp. 2694, 2019, DOI: 10.3389/fpsyg.2018.02694.
- [22] de Vries, J. P., “Conceptualising physical playfulness.” *International Journal of Play*, vol. 10, no. 3, pp. 243-260, 2021, DOI: 10.1080/21594937.2021.1959229.
- [23] Aguilar-Farias, N., Toledo-Vargas, M., Miranda-Marquez, S., Cortinez-O’Ryan, A., Cristi-Montero, C., Rodríguez-Rodríguez, F., ... & del Pozo Cruz, B., “Sociodemographic Predictors of Changes in Physical Activity, Screen Time, and Sleep among Toddlers and Preschoolers in Chile during the COVID-19 Pandemic,” *International journal of environmental research and public health*, vol. 18, no. 1, pp. 176, 2021, DOI: 10.3390/ijerph18010176.
- [24] Sattelmair, J., & Ratey, J., “Physically Active Play and Cognition: An Academic Matter?,” *American journal of play*, vol. 1, no. 3, pp. 365-374, 2009, <https://files.eric.ed.gov/fulltext/EJ1068997.pdf>.
- [25] Léniz-Maturana, L., Vilaseca, R., & Leiva, D., “Non-Intrusive Maternal Style as a Mediator between Playfulness and Children’s Development for Low-Income Chilean Adolescent Mothers,” *Children*, vol. 10, no. 4, pp. 609, 2023, DOI: 10.3390/children10040609.
- [26] Brockman, R., Jago, R., & Fox, K. R., “The contribution of active play to the physical activity of primary school children,” *Preventive medicine*, vol. 51, no. 2, pp. 144-147, 2010, DOI: 10.1016/j.yjmed.2010.05.012.
- [27] Gutierrez, M. A., Valdebenito, J., Vald é Carrasco, V. C., Robles Illesca, D., Reyes-Molina, D., & Zapata Lamana, R., “Escolares participantes y no participantes de un programa de integración escolar de un establecimiento educacional público de la provincia del Biob ó (Chile) presentan un similar estado nutricional, condición física y rendimiento académico,” *Revista Científica Salud Uninorte*, vol. 38, no. 2, pp. 438-454, 2022, DOI: 10.14482/sun.38.2.613.2.
- [28] World Medical Association., “World Medical Association Declaration of Helsinki: Ethical Principles for Medical Research Involving Human Subjects,” *JAMA*, vol. 310, no. 20, pp. 2191-2194, 2013, DOI: 10.1001/jama.2013.281053.
- [29] Squires, J., Bricker, D., Twombly, E., Nickel, R., Clifford, J., Murphy, K., Hoselton, R., Potter, L., Mounts, L., & Farrell, J., *Ages & Stages Questionnaires in Spanish®, Third Edition: A Parent-Completed Child Monitoring System (ASQ-3TM Spanish)*, 3rd ed, Paul H. Brookes Publishing: Baltimore, MD, USA, 2009, <http://bestkc.com/wp-content/uploads/2017/05/30-MESES-ASQ-SPANISH.pdf>.
- [30] Guevara, J., Gerdes, M., Localio, R., Huang, Y., Pinto-Martin, J., Minkovitz, C., Hsu, D., Kyriakou, L., Baglivo, S., Kavanagh, J., & Pati, S., “Effectiveness of developmental screening in an urban setting,” *Pediatrics*, vol. 131, no. 1, pp. 30-37, 2013, DOI: 10.1542/peds.2012-0765.

- [31] San Antonio, M., Fenick, A., Shabanova, V., Leventhal, J., & Weitzman, C., "Developmental screening using the ages and stages questionnaire: Standardized versus real-World conditions," *Infants and Young Children*, vol. 27, no. 2, pp. 111-119, 2014, DOI: 10.1097/IYC.0000000000000005.
- [32] Squires, J., Bricker, D., Twombly, E., Yockelson, S., Davis, M. S., & Kim, Y., *Ages & stages questionnaires: Social-emotional (ASQ: SE): A parent-completed, child-monitoring system for social-emotional behaviors*, 2nd ed, Baltimore, MD: Paul H. Brookes Publishing Company, 2002.
- [33] Toraldo, A., "Dissociations in neuropsychological single-case studies: Should one subtract raw or standardized (z) scores?," *Neuropsychologia*, vol. 169, pp. 108193, 2022, DOI: 10.1016/j.neuropsychologia.2022.108193.
- [34] Sanders, G., Juvancic-Heltzel, J., Williamson, M., Roemmich, J., Fedá, D., & Barkley, J., "The effect of increasing autonomy through choice on young children's physical activity behavior," *Journal of Physical Activity and Health*, vol. 13, no. 4, pp. 428-432, 2016, DOI: 10.1123/jpah.2015-0171.
- [35] Shablack, H., Becker, M., & Lindquist, K., "How do children learn novel emotion words? A study of emotion concept acquisition in preschoolers," *Journal of Experimental Psychology: General*, vol. 149, no. 8, pp. 1537, 2019, DOI: 10.1037/xge0000727.
- [36] World Health Organization, "WHO Guidelines on physical activity, sedentary behaviour and sleep for children under 5 year of age," World Health Organization, <https://apps.who.int/iris/bitstream/handle/10665/325147/WHO-NMH-PND-2019.4-eng.pdf?sequence=1&isAllowed=y>, (accessed dec. 10, 2022).
- [37] McGowan, A. L., Gerde, H. K., Pfeiffer, K. A., & Pontifex, M. B., "Meeting 24-hour movement behavior guidelines in young children: Improved quantity estimation and self-regulation," *Early Education and Development*, vol. 34, no. 3, pp. 762-789, 2023, DOI: 10.1080/10409289.2022.2056694.
- [38] Richards, A. B., Sheldrick, M. P., Swindell, N., Barker, H. G., Hudson, J., & Stratton, G., "Qualitative changes in children's physical activity and sedentary behaviours throughout the COVID-19 pandemic: The HomeSPACE project," *PloS one*, vol. 18, no. 1, pp. e0280653, 2023, DOI: 10.1371/journal.pone.0280653.
- [39] González, S., Álvarez, V., & Nelson, E., "Do Gross and Fine Motor Skills Differentially Contribute to Language Outcomes? A Systematic Review," *Frontiers in Psychology*, vol. 10, pp. 2670, 2019, DOI: 10.3389/fpsyg.2019.02670.
- [40] LeBarton, E., & Landa, R., "Infant motor skill predicts later expressive language and autism spectrum disorder diagnosis," *Infant Behavior and Development*, vol. 54, pp. 37-47, 2019, DOI: 10.1016/j.infbeh.2018.11.003.
- [41] Peyre, H., Albaret, J., Bernard, J., Hoertel, N., Melchior, M., Forhan, A., Taine, M., Heude, B., de Agostini, M., Galéra, C., Ramus, F., Annesi-Maesano, I., Bernard, J., Botton, J., Charles, M., Dargent-Molina, P., de Lauzon-Guillain, B., Ducimetière, P., de Agostini, M., ... & Thiebaugeorges, O., "Developmental trajectories of motor skills during the preschool period," *European Child and Adolescent Psychiatry*, vol. 28, no. 11, pp. 1461-1474, 2019, DOI: 10.1007/s00787-019-01311-x.
- [42] Bidzan-Bluma, I., & Lipowska, M., "Physical activity and cognitive functioning of children: A systematic review," *International Journal of Environmental Research and Public Health*, vol. 15, no. 4, pp. 800, 2018, DOI: 10.3390/ijerph15040800.
- [43] Cano, M., Oyarzún, T., Leyton, F., & Sepúlveda, C., "Relación entre estado nutricional, nivel de actividad física y desarrollo psicomotor en preescolares," *Nutrición hospitalaria*, vol. 30, no. 6, pp. 1313-1318, 2014, DOI: 10.3305/nh.2014.30.6.7781.
- [44] Rodríguez, A., García, A., & Merino, M., "Programa educativo de integración del movimiento mediante el juego en Educación Infantil: evaluación y análisis," *Sportis: Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad*, vol. 6, no. 3, pp. 408-425, 2020, DOI: 10.17979/sportis.2020.6.3.6158.
- [45] Jiménez, J., & Araya, G., "Efecto de una intervención motriz en el desarrollo motor, rendimiento académico y creatividad en preescolares," *Pensar en movimiento: Revista de Ciencias del Ejercicio y la Salud*, vol. 7, no. 1, pp. 11-22, 2009, DOI: 10.15517/pensarmov.v7i1.373.
- [46] Li, X., Lam, C., Chung, K., Cheung, R., Leung, C., & Fung, W., "Development and Validation of the Chinese Inventory of Children's Socioemotional Competence (CICSEC)," *Early Education and Development*, vol. 31, no. 6, pp. 854-872, 2020, DOI: 10.1080/10409289.2020.1715735.
- [47] Trevlas, E., Matsouka, O., & Zachopoulou, E., "Relationship between playfulness and motor creativity in preschool children," *Early Child Development and Care*, vol. 173, no. 5, pp. 535-543, 2003, DOI: 10.1080/0300443032000070482.
- [48] Chiarello, L., Huntington, A., & Huntington, A., "A comparison of motor behaviors, interaction, and playfulness during mother-child and father-child play with children with motor delay," *Physical & occupational therapy in pediatrics*, vol. 26, no. 1-2, pp. 129-151, 2006, DOI: 10.1080/J006v26n01_09.
- [49] Efrain, M., Kirwan, C., Muncy, N., Tucker, L., Kwon, S., & Bailey, B., "Acute after-school screen time in children decreases impulse control and activation toward high-calorie food stimuli in brain regions related to reward and attention," *Brain imaging and behavior*, vol. 15, no. 1, pp. 177-189, 2021, DOI: 10.1007/s11682-019-00244-y.
- [50] Janssen, X., Martin, A., Hughes, A., Hill, C. M., Kotronoulas, G., & Hesketh, K., "Associations of screen time, sedentary time and physical activity with sleep in under 5s: A systematic review and meta-analysis," *Sleep medicine reviews*, vol. 49, pp. 101226, 2020, DOI: 10.1016/j.smrv.2019.101226.
- [51] Craggs, C., Corder, K., van Sluijs, E., & Griffin, S., "Determinants of change in physical activity in children and adolescents: A systematic review," *American Journal of Preventive Medicine*, vol. 40, no. 6, pp. 645-658, 2011, DOI: 10.1016/j.amepre.2011.02.025.
- [52] Léniz-Maturana, L., Vilaseca, R., & Leiva, D., "Maternal self-efficacy and emotional well-being in Chilean adolescent mothers: the relationship with their children's social-emotional development," *PeerJ*, vol. 10, e13162, 2022. DOI: 10.7717/peerj.13162.

- [53] Erickson, S. J., Duvall, S. W., MacLean, P. C., Tonigan, J. S., Ohls, R. K., & Lowe, J. R., "Mother-Child Interactive Behaviors and Cognition in Preschoolers Born Preterm and Full Term," *Journal of Child and Family Studies*, vol. 27, no. 11, pp. 3687-3700, 2018, DOI: 10.1007/s10826-018-1196-z.
- [54] Contreras, D., & González, S., "Determinants of early child development in Chile: Health, cognitive and demographic factors," *International Journal of Educational Development*, vol. 40, pp. 217-230, 2015, DOI: 10.1016/j.ijedudev.2014.06.010.
- [55] Goncalves, W. S. F., Byrne, R., de Lira, P. I. C., Viana, M. T., & Trost, S. G., "Parental influences on physical activity and screen time among preschool children from low-income families in Brazil," *Childhood Obesity*, vol. 19, no. 2, pp. 112-120, 2023, DOI: 10.1089/chi.2021.0305.
- [56] Zeng, N., Ayyub, M., Sun, H., Wen, X., Xiang, P., & Gao, Z., "Effects of physical activity on motor skills and cognitive development in early childhood: a systematic review," *BioMed research international*, vol. 2017, 2017, DOI: 10.1155/2017/2760716.
- [57] Veitch, J., Bagley, S., Ball, K., & Salmon, J., "Where do children usually play? A qualitative study of parents' perceptions of influences on children's active free-play," *Health & place*, vol. 12, no. 4, pp. 383-393, 2006, DOI: 10.1016/j.healthplace.2005.02.009.
- [58] Myer, G., Faigenbaum, A., Edwards, N., Clark, J., Best, T., & Sallis, R., "Sixty minutes of what? A developing brain perspective for activating children with an integrative exercise approach," *British Journal of Sports Medicine*, vol. 49, no. 23, pp. 1510-1516, 2015, DOI: 10.1136/bjsports-2014-093661.
- [59] Zhao, M., & Chen, S., "The effects of structured physical activity program on social interaction and communication for children with autism," *BioMed research international*, vol. 2018, 2018, DOI: 10.1155/2018/1825046.
- [60] Jiménez, C., Benavides, E., Ornelas, M., Rodríguez, J., Lira, S., & Laguna, A., "Habilidades motrices y su relación con las actividades y creencias parentales en preescolares; comparaciones por nivel socio-económico," *Sportis*, vol. 6, no. 1, pp. 122-144, 2020, DOI: 10.17979/sportis.2020.6.1.5388.
- [61] Rothbart, M., & Bates J., "Temperament," in *Handbook of child psychology: Social, emotional, and personality development*, Damon & N. Eisenberg, 2006, pp. 105-176, DOI: 10.1002/9780470147658.chpsy0303.