Gross motor development in preschoolers on the islands of Lake Titicaca (3810 m a.s.l.), Puno, Peru

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Abstract. The objective of this study was to analyze gross motor development in preschoolers on the islands of Lake Titicaca, considering the variables sex and age. The study corresponds to the descriptive-comparative cross-sectional design. 57 preschool children (31 boys and 26 girls, age M = 5.0, TD = .54) from the islands of Amantani, Taquile and Uros, located in the province of Puno (Peru), at an altitude of 3810 m a.s.l. participated. TGMD-2, Spanish version (reproducibility of .82) was used. The results show an average gross motor development (50.9%), with an age equivalent to six years (M = 6.0, TD = .82), one year above its chronological age (M = 5.0, TD = .54). Differences were found between islands (p = .01 <.05). No gender differences were found in gross motor development (p = .15 >.05) or in locomotion development (p = .74 >.05), but in object control (p = .00 <.05), as well as in age (p = .00 <.05). It is concluded that the preschoolers present an average gross motor development with an equivalent age of one year older than their chronological age, of which preschool children from Taquile stand out by presenting a higher – above average development, with an equivalent age of one year and nine months older than their chronological age, being superior to those of Amantaní and Uros, who present an average development and a lower equivalent age. Women show more development than men only in object control. Those of four years present more development than those of five.

Key words: Gross motor development, locomotion, object control, chronological age, equivalent age, preschool, Titicaca Lake.

Introduction

Motor development is a continuous and multidimensional process of the human life cycle (Pavez-Adasme et al., 2020). The preschool age constitutes the most abundant space of life in experiences that involve movement and expression. Movement is for the child, from birth, not only a form of expression, but an irreplaceable means by which he discovers himself and the environment that surrounds him, allowing him to function independently (Robinson & Goodway, 2009), interact with other children, manipulate objects and explore space (Da Fonseca, Garrote, Todoli, & Zenarruzabeitia, 2014). Motor development constitutes a crucial area within the child’s global development (Kodzman, 2019), with childhood being the ideal and determining stage for learning motor skills (Delgado & Montes, 2016; Sánchez, 2019), due to the fact that It is a period of maximum sensitivity and vulnerability to the influence of the environment (Ruiz, 2004). The education of the preschool child, basically, is given in function of the motor action in that all knowledge –learning– starts from the child’s own action on the environment (Celis, 2015). Likewise, Teixeira, Barcala-Furelos, Abelaíras-Gomez and Arufe-Giraldez (2015) point out that motor experiences are an essential condition for didactic adaptation in child learning.

Sánchez (2019) defines motor development as the control of body movements through the coordinated activity of nerve centers, nerves and muscles. In the framework of the approaches of Baena, Granero and Ruiz (2010); Gallahue (1987); Kodzman (2019); and Rizzoli et al. (2013), we understand motor development as changes in human motor skills from birth to old age, the result of the interaction between genetic and environmental factors, which is based on biological, psychological and social evolution, resulting in the organic and functional maturation of the nervous system, the development of psychic functions and the structuring of the personality.

Cobos (2007) define gross motor development as the natural process that human beings develop at different stages of their lives, in which synchronized muscle movements are acquired to maintain balance, acquire agility, strength and speed, as well as rhythm. These evolutions are subject to the...
maturity of the central and peripheral nervous system, the stimulation levels, the genetic load, the socioeconomic and demographic conditions.

Gross motor development is considered as the basic vocabulary of motor skills, on which the most complex and specialized motor responses are built (García-Marin & Fernández-López, 2020), in order to achieve adequate motor competence, that is, to achieve that the person obtains a set of skills and abilities with which he can carry out complex motor tasks to be effective and efficient in his environment (Luis-de-Cos, Arribas-Gallaraga, Luis-de-Cos, & Arruza, 2019; Payne & Isaacs, 2007; Ruiz-Pérez, 2014; Ruiz-Pérez et al., 2015).

According to Alcover (2010); Campo (2011); Castañer et al. (2012); Delgado and Montes (2017); Jones, Hinkley, Okely and Salmon (2013); Pons and Arufe (2016), adequate motor competence at preschool age enables the child to: First, successfully cope with the motor challenges of daily life and adapt to the characteristics of a changing environment. Also, it helps the initial development of the nervous system, which determines the neural connections that will be used for the learning of formal skills and the acquisition of knowledge. In addition, it favors the control of his or her the body and a sense of security that, soon, becomes psychological security (both elements are important for personality development). Furthermore, it promotes the acquisition of physical activity behaviors and healthy lifestyle habits, which will accompany the child throughout his life, helping him to prevent a number of diseases such as obesity, stress, etc. Finally, the child will be able to successfully surpass achieve the curricular objectives and have greater social success.

Robinson et al. (2015) argue that adequate motor competence in childhood is an essential factor to get involved in the practice of physical activity; likewise, it predicts the possibilities of its practice in the future (Cano, Oyarzún, Leyton, & Sepúlveda, 2014; González-Gross & Meléndez, 2013; Lopes et al., 2011); that is, it functions as an important health indicator (Barnett & Goodway, 2018; Slater et al., 2010). Physical activity produces greater brain oxygenation, favoring neuronal plasticity, the basis of learning (Bueno, 2015). Healthy habits socialized in childhood, especially that of physical activity, are good predictors of the future in terms of the quality of life of the population (Arribas-Gallaraga et al., 2018; Molina, 2018).

In contrast, children with inadequate motor skills experience severe difficulties during their daily activities: they fall frequently, are afraid of physical activity, often drop things, tire quickly when they do physical activity, have poor posture, lack strength, are overweight, have difficulty stopping when running or playing. These difficulties cause episodes of anxiety, depression, loneliness, isolation, rejection, and ridicule in the playground at playtime (Coplan, Findlay, & Nelson, 2004; Nelson et al., 2009; Ruiz, Mata, & Moreno, 2007) or during social participation (King-Dowling et al., 2015); they also cause less participation or even withdrawal from the practice of sports activities (Batey et al., 2013; Cairney, Hay, Veldhuizen, Missiuna, & Faught, 2009; Delgado & Montes, 2017). Children’s gross motor development problems can persist throughout their later development (Bornstein & Hendricks, 2013), making it difficult to acquire more complex skills (Campo, 2011). The most alarming of all this is that these problems are transferred to school performance (King-Dowling et al., 2015), that is, gross motor development problems negatively affect learning processes (Carboni-Román et al., 2006).

The objective of this study, then, was to analyze gross motor development in preschoolers on the islands of Lake Titicaca, considering the variables sex and age.

**Material and method**

**Design**

The research design was descriptive, comparative cross-sectional.

**Participants**

The study included 57 children (Age M=5.0, SD=.54), from a population of 70 (13 children did not participate because they did not attend on the day of the scheduled assessment), from seven public preschool institutions on the islands of Lake Titicaca (Amantani, Taquile, and Uros; table 1; figure 1), Puno, Peru, located at an altitude of 3810 m above sea level.

![Amantaní, Taquile and Uros islands, Puno, Peru](image)

**Table 1. Descriptive data of the study sample**

| Islands | Age (M±SD) | Sex (M±SD) |
|---------|------------|------------|
| Amantaní (32-54.1) | 5.0 (.54) | Man (31-54.4) |
| Taquile (11-19.3) | 5.0 (.54) | Woman (26-45.6) |
| Uros (14-24.6) | 5.0 (.54) | Woman (26-45.6) |

**Table 2. Results and equivalent motor development level**

| Standard result | Gross motor quotient | Motor development level |
|-----------------|----------------------|-------------------------|
| 17-20 | Greater than 130 | Much higher |
| 15-16 | 121-130 | Higher |
| 13-14 | 111-120 | Above average |
| 8-12 | 90-110 | Average |
| 6-7 | 80-89 | Below average |
| 4-5 | 70-79 | Poor |
| 1-3 | Less than 70 | Very poor |

**Figure 1. Location of the Amantaní, Taquile and Uros islands, Puno, Peru**

**Instrument**

The Test of Gross Motor Development, Second Edition TGMD-2 (Ulrich, 2000) was considered as a data collection tool. The Spanish version was used (Ayán et al., 2019; Cano-Cappellacci, Aleitte, & Durán, 2015). The TGMD-2 is applicable to children between three to 10 years old, it comprises twelve skills grouped into two sub-tests: locomotion sub-test (running, canter, standing jump, jump, horizontal jump and lateral step) and sub-test Object Control (Stationary Ball Hit, Stationary Dribble, Catch, Kick, Over-the-Shoulder Throw and Below-the-Hip Throw).

The execution of each skill is valued according to qualitative criteria that are scored as zero (0) or one (1) depending on whether they are met or not in two attempts. The criteria for each skill range from 3 to 5. Both the locomotion sub-test and the object control sub-test have 24 criteria, which allow a gross result of up to 48 points. The gross result of the locomotion sub-test and the object control sub-test are each transformed into a standard result; the
sum of both gives us the sum of standard results; this result is transformed into a gross motor quotient. The standard result allows determining the level of motor development of locomotion and object control. The motor quotient score allows determining the level of gross motor development. Motor development has seven levels (Table 2): 1) very poor, 2) poor, 3) below average, 4) average, 5) above average, 6) higher, and 7) much higher.

The TGMD-2 used has a reproducibility of Stability Coefficient (Test-retest performed one week later on 18 children representing 32% of the studied population) of .78 locomotion, .82 object control, and .82 score total.

**Process**

The application of the TGMD-2 in the study subjects was developed according to the following route: First, the permission of the responsible authority of the seven participating institutions was managed. Second, the same was done with the permission of the parents through the informed consent form, in which all parents agreed and authorized their children’s participation in the study; Likewise, informed assent was applied, so there was children’s acceptance to participate in the study. Third, the children were assessed, four at a time, on each of the skills (Attempt 1 and then Attempt 2). The children’s performance of the skills was digitally recorded. Fourth, the TGMD-2 examiner’s record sheet was completed via videotape viewing. To avoid errors, the video was observed three times for each of the criteria and attempts. The people who applied the instrument are physical education professionals who were previously trained, so they knew perfectly the protocol to follow.

**Data analysis**

In order to know and compare the characteristics of gross motor development in preschoolers on the islands of Lake Titicaca, the percentage analysis, the mean and standard deviation were used for the descriptive analysis, and the Anova and T-Test for the inferential analysis. Verification of data normality was given using the Kolmogorov-Smirnov test. Statistical calculations were carried out in Excel and SPSS version 25.

**Results**

The highest percentage of gross motor development (GMD) of preschoolers on the islands of Lake Titicaca corresponds to the average level (50.9%), and the same is reflected on the islands of Amantaní (53.1%) and Uros (64.3%); while in the preschools of Taquile Island a higher-than-average level is observed (36.4%). With respect to the motor development of locomotion (MDL) at the general level of the islands, the highest percentage corresponds to the average level (73.7%), reflecting the same in the Amantaní (71.9%), Taquile (72.7%) and Uros (78.6%) islands. In reference to the object control motor development (OCMD) at the general level of the islands, the highest percentage corresponds to the average level (74.4%), and the same is reflected in the Uros Island (71.4%); while in the preschool of Amantaní island a level above the average - average is observed (43.8%), and in the preschoolers on Taquile a higher level is observed (45.5%) (Table 3).

On the side of the equivalent age, the preschoolers on the islands of Lake Titicaca present a GMD age equivalent of six years (M = 6.0, SD = .82), one year above their chronological age (M = 5.0, SD = .54) The preschoolers on the island of Amantaní have a GMD age equivalent of five years and nine months (M = 5.9, TD = .80), one year above their chronological age (M = 4.9, TD = .56), one month below the global average equivalent age (M = 6.0, TD = .80). Preschoolers on Taquile Island have a GMD age equivalent of five years and eight months (M = 5.8, TD = .69), five months above their chronological age (M = 5.3, TD = .35), four months below the overall average of the equivalent age, (M = 6.0, TD = .82) (Table 4). With respect to the MDL, the preschoolers on the islands present an age equivalent of five years and four months (M = 5.4, DT = 1.05), four months above the average of the chronological age (M = 5.0, DT = .54). Preschoolers in Amantaní present a MDL age equivalent of five years and three months (M = 5.3, TD = 1.16), six months above the average of the chronological age (M = 4.9, TD = .35), four months above their chronological age (M = 5.3, TD = .35), five months above the overall average of the equivalent age (M = 6.0, TD = .82). Preschoolers on Uros Island have a GMD age equivalent of five years and eight months (M = 5.8, TD = .69), five months above their chronological age (M = 5.3, TD = .35), four months below the overall average of the equivalent age (M = 6.0, TD = .82). Preschoolers on Taquile Island have a GMD age equivalent of six years and eight months (M = 6.6, TD = .81), one year and nine months above their chronological age (M = 4.9, TD = .52), six months above the overall average of the equivalent age (M = 6.0, TD = .82).

**Table 3**

| Motor development level | Amantaní | Taquile | Uros | Global |
|-------------------------|----------|---------|------|--------|
| Above average           | 14       | 3       | 3    | 20     |
| Average                 | 17       | 4       | 9    | 30     |
| Below average           | 1       | 0       | 0    | 1      |
| Average GMD age         | 5.9      | 4.9     | 3.1  | 4.5    |
| Above average GMD age   | 6.6      | 5.9     | 5.3  | 6.0    |
| Average GMD age         | 5.3      | 4.9     | 3.1  | 4.6    |
| Below average GMD age   | 4.9      | 4.3     | 3.1  | 4.1    |

**Table 4**

| Motor development according to chronological age and equivalent age | Amantaní | Taquile | Uros | Global |
|---------------------------------------------------------------|----------|---------|------|--------|
| Above average chronology (n=32)                               | 14       | 3       | 3    | 20     |
| Average GMD age                                               | 5.9      | 4.9     | 3.1  | 4.5    |
| Above average equivalent GMD age                              | 6.6      | 5.9     | 5.3  | 6.0    |
| Average equivalent GMD age                                    | 5.3      | 4.9     | 3.1  | 4.6    |
| Below average equivalent GMD age                              | 4.9      | 4.3     | 3.1  | 4.1    |

**Table 5**

| Inter-variance analysis (ANOVA) of the gross motor quotient and standard result | n | M | SD |
|---------------------------------------------------------------------------------|---|---|----|
| GMD Amantaní                       | 32 | 108.34 | 10.30 |
| GMD Taquile                        | 11 | 115.55 | 9.37 |
| GMD Uros                           | 14 | 102.79 | 9.74 |
| GMD Global                         | 57 | 108.37 | 10.69 |
| SLR Amantaní                       | 32 | 10.19  | 2.21 |
| SLR Taquile                        | 11 | 11.36  | 1.80 |
| SLR Uros                           | 14 | 9.29   | 1.98 |
| SLR Global                         | 57 | 10.64  | 2.16 |
| TOC Amantaní                       | 32 | 12.47  | 1.04 |
| TOC Taquile                        | 11 | 13.82  | 1.83 |
| TOC Uros                           | 14 | 11.64  | 2.13 |
| TOC Global                         | 57 | 12.33  | 1.90 |

**Table 6**

| Motor development according to sex and age (Test T) | n | M | SD |
|----------------------------------------------------|---|---|----|
| GMD Man 1                                           | 26 | 101.62 | 10.30 |
| GMD Woman 2                                         | 31 | 10.29  | 2.34 |
| SLR Man 3                                           | 30 | 10.34  | 0.74 |
| SLR Woman 2                                         | 31 | 11.74  | 1.59 |
| TOC Man 2                                           | 26 | 11.46  | 1.84 |
| TOC Woman 2                                         | 31 | 11.74  | 1.59 |
Colombian school population (between six and 10 years old), also identified an average GMD in the subjects studied. Ba-
Mexican preschoolers (between four and five years old), who Bermudez, Poblete, Pineda, Castro and Inostroza (2018) in preschoolers (between three and four years old); and those from the Amantani (average) and Uros (average) from Taquile (higher-than-average) present higher GMD than present an average GMD. At the island level, preschoolers the variables sex and age. The results show that preschoolers in preschoolers of the islands of Lake Titicaca, considering (Table 6).

MDL (p = .01 <.05) and MDOC (p = .01 <.05), being the of age, differences are found both in the GMD (p = .00 <.05), women have a higher average (M = 11.7, DT = 1.59). In the case in the GMD (p = .15 > .05) and MDL (p = .74 > .05), as well as the standard locomotion result (SLR) (p = .01 <.05). Regarding the object control standard result (OCSR), they do not present differences (p = .05 > .05) (Table 5).

Regarding sex, there are no differences between men and women in the GMD (p = .15 > .05) and MDL (p = .74 > .05), but in the MDOC (p = .00 <.05), women have a higher average (M = 13.46, TD = 1.84) than men (M = 11.7, DT = 1.59). In the case of age, differences are found both in the GMD (p = .00 <.05), MDL (p = .01 <.05) and MDOC (p = .01 <.05), being the children of four years who present greater motor development (Table 6).

**Discussion**

The present study had as objective to analyze the GMD in preschoolers of the islands of Lake Titicaca, considering the variables sex and age. The results show that preschoolers present an average GMD. At the island level, preschoolers from Taquile (higher-than-average) present higher GMD than those from the Amantani (average) and Uros (average) islands, repeating the same at the equivalent age. These findings are similar (except for those of Taquile Island) to those found by Iriarte, Pacheco and Tapia (2018) in Chilean preschoolers (between three and four years old); and Bermudez, Poblete, Pineda, Castro and Inostroza (2018) in Mexican preschoolers (between four and five years old), who also identified an average GMD in the subjects studied. Barrios and Mendieta (2018), in their study of an older Colombian school population (between six and 10 years old), identified a poor GMD, whose results are lower than those found in the study and to those referred to. We did not find results similar to those achieved by preschoolers on Taquile Island. The motor skills presented by the preschoolers from the islands of Lake Titicaca, especially Taquile Island, will allow them to interact efficiently with their peers; it will also allow them to integrate more easily into the practice of physical activities and sports (Cairney et al., 2009; Lopes, Santos, Pereira, & Lopes, 2012; Stodden et al., 2008), with more influence on later stages (Barlela, 2013).

As for MDL, the results show that preschoolers on the islands of Lake Titicaca have an average MDL. At the island level, all three present the same MDL (average) and equal to the overall. With respect to the equivalent age, the preschoolers on the island of Taquile present a higher age than those on the islands of Amantani and Uros. These findings coincide with those found by Valentini (2012) in Brazilian preschoolers (between four and five years old); Iriarte et al. (2018) in Chilean preschoolers (between three and four years old); and Martínez (2017) in Colombian preschoolers (5 years old), who also identified an average MDL in the subjects studied. We did not find different findings from the study. In general, preschoolers with these locomotion characteristics present autonomy in their movements (walking, running or jumping) to explore their environment (Molina, 2009; Palau, 2005).

In relation to the OCMD, the results show that preschoolers on the islands of Lake Titicaca have an average OCMD. At the island level, preschoolers on Taquile Island (upper) have a higher average OCMD than preschoolers on Amantani Island (above average-average) and Uros Island (average), with the latter being the least developed. As for the equivalent age, the same result is given. These findings are similar (except for the Taquile and Amantani islands) to those found by Valentini (2012) in Brazilian preschoolers (between four and five years old); Iriarte et al. (2018) in Chilean preschoolers (between three and four years old); and Martínez (2017) in Colombian preschoolers (five years old), who also identified an average OCMD in the subjects studied. Pope, Liu y Getchell (2011), in their study of vulnerable Hispanic preschoolers (ages 3-4) residing in the United States, and and Amui Goodway, Robinson and Amui (2007), in their study of vulnerable Hispanic and African-American preschoolers residing in the United States, identified a poor OCMD, results that are lower than those achieved in the study and to those referred to. In this contrast, preschoolers on the Taquile and Amantani islands have a higher OCMD than those identified in other contexts, especially with respect to the U.S. children mentioned. This difference is due to the influence of the environmental factor (García-Marin & Fernández-López, 2020; Guillen et al., 2019), that is, the characteristics of the environment (Castañer et al., 2012). It has been shown that natural spaces favor motor skills in the early stages (Castell, 2020). In this sense, children from the Taquile and Amantani islands are surrounded by natural spaces and resources, which allows them to interact effectively and efficiently with objects spontaneously (Martínez, 2017), which is not the case especially for children in the United States, who live in an increasingly artificialized environment, an environment that generates little active
behavior (Castell, 2020).

According to sex, both men and women on the islands of Lake Titicaca have a similar GMD and MDL, but different in the OCMD, with women being more developed than men. As for the GMD, Bermudez et al. (2018), in their study of Mexican preschoolers (between four and five years old), found similar results. In contrast, Valentini (2012), in Brazilian preschoolers (between four and five years old), and Iriarte et al. (2018), in Chilean preschoolers (between three and four years old), found different results: in the first case, they found that boys were more developed than girls; and in the second case, they found that girls were more developed than boys. It is worth noting that in both studies similar results were found regarding MDL. Regarding the OCMD, no similar, but different results were found. Pope et al. (2011), in vulnerable Hispanic preschoolers (three to four years old) living in the United States, and Iriarte et al. (2018), in Chilean preschoolers (three to four years old), found that both women and men had similar development. For their part, Valentini (2012), in Brazilian preschoolers (ages four to five), and Goodway et al. (2007), in vulnerable Hispanic and African-American preschoolers living in the United States, found that boys were more developed than girls.

In relation to age, results show that four-year-old preschoolers on the islands of Lake Titicaca have higher GMD, MDL and OCMD scores than the five-year-old ones. The findings found by Valentini (2012) in Brazilian preschoolers (between four and five years old) are contrary to those reached in the study, since five-year-old preschoolers show greater development than the four-year-old ones. No similar results were found.

The various studies related to gross motor development, particularly the present study, do not emphasize the analysis of the results on the basis of the equivalent age, doing so solely on the basis of categorizations, this being one of its main limitations. In the present study we find that it is possible to carry out a more accurate analysis of results using the equivalent age.

We recommend carrying out gross motor development studies that include variables as priority activities that the family environment deals with; culture or lifestyle of the family environment; time parents spend interacting with their children at home and free spaces; access and use of technology by children; occupation of free time; nutritional condition; school performance (reasoning and reading comprehension); socioeconomic level; motor intervention at school; development of social skills; among others, that can explain to us how much one influences the other, so that it is possible to act and intervene efficiently and in a timely manner in the overall development of the preschooler, especially the motor; in such a way that it can positively influence other variables of direct linkage.

Conclusions

The preschoolers present an average gross motor development with an equivalent age of one year older than their chronological age, highlighting the Taquile preschoolers by presenting an above-average development with an equivalent age of one year and nine months older than their chronological age, being superior to those of Amantaní and Uros, who present an average development and a lower equivalent age.

Regarding the motor development of locomotion, in general, preschoolers present an average development with an equivalent age of four months older than their chronological age. At the island level, they present a similar development, differing in the equivalent age, being superior those of Taquile.

In relation to the motor development of object control, in general, they present an average development with an equivalent age of one year and six months greater than their chronological age, highlighting the Taquile preschool children by presenting a superior development with an equivalent age of two years and six months older than their chronological age, far exceeding those of Amantaní and Uros, the latter being the one with the least development.

Regarding sex, there are only differences in the motor development of object control, being the women who present greater development.

Regarding age, overall, preschoolers with four years of age show more development than those with five.

References

Alcover, E. (2010). Seguimiento del desarrollo psicomotor de pre-maturos extremos mediante la Escala de Desarrollo Infantil de Kent (EDIK) cumplimentada por los padres y situación neuroevolutiva a los 2 y 5 años [Tesis doctoral, Universitat de Barcelona]. http://www.tdx.cat/bitstream/handle/10803/2505/EAB_TESIS.pdf?sequence=1

Arribas-Gallarraga, S., Luís-de Cos, G., Luis-de Cos, L., & Saies, E. (2018). Chicas adolescentes: Competencia motriz, práctica de actividad físico-deportiva e intención de práctica futura. Journal of Sport and Health Research, 10(1), 135–144. http://www.journalshr.com/papers/Vol10_suplemento/JSHR_V10_supl_03.pdf

Barela, J. A. (2013). Fundamental motor skill proficiency is necessary for children’s motor activity inclusion. Motriz. Revista de Educación Física, 19(3), 548–551. https://doi.org/10.1590/S1980-65742013000300003

Barnett, L., & Goodway, J. (2018). Perceptions of movement competence in children and adolescents from different cultures and countries: A commentary. Journal of Motor Learning and Development, 6, S474–S480. https://doi.org/10.1123/jmld.2018-0018

Barrios, L., & Mendieta, L. (2018). Desarrollo motor en niños de la básica primaria de la Institucion Educativa Tecnica Jimenez de Quezada de Armero Guayabal Tolima [Tesis de maestría, Universidad de Tolima]. http://repositorio.ut.edu.co/bitstream/001/2723/1/T_0945_681_CD6190.pdf

Batey, C. A., Missiuna, C. A., Timmons, B. W., Hay, J. A., Faught, B. E., & Cairney, J. (2013). Self-efficacy toward physical activity and the physical activity behavior of children with and without Developmental Coordination Disorder. Human Movement Science, 36, 258–271. https://doi.org/10.1016/j.humov.2013.10.003

Bermudez, M., Poblete, F., Pineda, A., Castro, N., & Inostroza, F. (2018). Nivel de desarrollo motor grueso en preescolares de México sin profesores de educación física. Revista Ciencias de La Actividad Física, 19(1), 75–81. https://doi.org/10.29035/rcaf.19.1.8

Bornstein, M. H., & Hendricks, C. (2013). Screening for developmental disabilities in developing countries. Social Science & Medicine, 97, 307–315. https://doi.org/10.1016/j.socscimed.2012.09.049

Bueno, D. (2015). Neuroeducación: por otra escuela [video]. Universidad de Barcelona. https://www.youtube.com/watch?v=QiRqCKU3RDe

References

Alcover, E. (2010). Seguimiento del desarrollo psicomotor de pre-maturos extremos mediante la Escala de Desarrollo Infantil de Kent (EDIK) cumplimentada por los padres y situación neuroevolutiva a los 2 y 5 años [Tesis doctoral, Universitat de Barcelona]. http://www.tdx.cat/bitstream/handle/10803/2505/EAB_TESIS.pdf?sequence=1

Arribas-Gallarraga, S., Luís-de Cos, G., Luis-de Cos, L., & Saies, E. (2018). Chicas adolescentes: Competencia motriz, práctica de actividad físico-deportiva e intención de práctica futura. Journal of Sport and Health Research, 10(1), 135–144. http://www.journalshr.com/papers/Vol10_suplemento/JSHR_V10_supl_03.pdf

Barela, J. A. (2013). Fundamental motor skill proficiency is necessary for children’s motor activity inclusion. Motriz. Revista de Educación Física, 19(3), 548–551. https://doi.org/10.1590/S1980-65742013000300003

Barnett, L., & Goodway, J. (2018). Perceptions of movement competence in children and adolescents from different cultures and countries: A commentary. Journal of Motor Learning and Development, 6, S474–S480. https://doi.org/10.1123/jmld.2018-0018

Barrios, L., & Mendieta, L. (2018). Desarrollo motor en niños de la básica primaria de la Institucion Educativa Tecnica Jimenez de Quezada de Armero Guayabal Tolima [Tesis de maestría, Universidad de Tolima]. http://repositorio.ut.edu.co/bitstream/001/2723/1/T_0945_681_CD6190.pdf

Batey, C. A., Missiuna, C. A., Timmons, B. W., Hay, J. A., Faught, B. E., & Cairney, J. (2013). Self-efficacy toward physical activity and the physical activity behavior of children with and without Developmental Coordination Disorder. Human Movement Science, 36, 258–271. https://doi.org/10.1016/j.humov.2013.10.003

Bermudez, M., Poblete, F., Pineda, A., Castro, N., & Inostroza, F. (2018). Nivel de desarrollo motor grueso en preescolares de México sin profesores de educación física. Revista Ciencias de La Actividad Física, 19(1), 75–81. https://doi.org/10.29035/rcaf.19.1.8

Bornstein, M. H., & Hendricks, C. (2013). Screening for developmental disabilities in developing countries. Social Science & Medicine, 97, 307–315. https://doi.org/10.1016/j.socscimed.2012.09.049

Bueno, D. (2015). Neuroeducación: por otra escuela [video]. Universidad de Barcelona. https://www.youtube.com/watch?v=QiRqCKU3RDe
Lopes, J., Hay, J. A., Veldhuizen, S., Missiuna, C., & Faught, B. E. (2009). Developmental coordination disorder, sex, and activity deficit over time: A longitudinal analysis of participation trajectories in children with and without coordination difficulties. *Developmental Medicine and Child Neurology*, 52(3), 67–72. https://doi.org/10.1111/j.1469-8749.2009.03520.x

Campo, L. (2011). Características del desarrollo adaptativo en niños de 3 a 7 años de la ciudad de Barranquilla. *Psicología*, 5(2), 95–104. https://doi.org/10.21250/19002386.1136

Cano, M., Oyarzún, T., Leyton, F., & Sepúlveda, C. (2014). Relación entre estado nutricional, nivel de actividad física y desarrollo psicomotor en preescolares. *Nutrición Hospitalaria*, 30(6), 1313–1318. https://doi.org/10.3305/nh.2014.30.6.7781

Carboni-Román, A., Del Río Grande, D., Capilla, A., Maestú, F., & Guillen, L., Rojas, L., Formoso, A. A., Contreras, L. M., & Estevez, J. (2019). Competencia motriz, comprensión y ansiedad de las chicas en Educación Física. *Retos*, 36, 231–238. https://recyt.fecyt.es/index.php/retos/article/view/64243

Martínez, M. (2017). Nivel del desarrollo motor grueso (manipulación y locomoción). *12° Congreso Argentino de Educación Física y Ciencias del Deporte. Universidad Nacional de la Plata*. http://www.memoria.fahce.unlp.edu.ar/trab_eventos/ev10300/ev10300.pdf

Molina, F. (2018). Educación física, calidad de vida y la nueva sociología de la infancia: Repensando la Metodología Mixta en Sociología. *Retos*, 33, 69–73. https://recyt.fecyt.es/index.php/retos/article/view/51510/38061

Molina, R. (2009). El desarrollo de la densopercepción. *Innovación y Experiencias Educativas*, 45(15), 1. https://doi.org/10.1998-6047

Nelson, L., Hart, C., Evans, C., Coplan, R., Roper, S., & Robinson, C. (2009). Behavioral and relational correlates of low self-perceived competence in young children. *Early Childhood Research Quarterly*, 24(3), 350–361. https://doi.org/10.1016/j.ecresq.2009.06.002

Palau, E. (2005). Aspectos básicos del desarrollo infantil: la etapa de 0 a 6 años. Ediciones CEAC.

Payne, G., & Isaacs, L. D. (2007). *Desenvolvimento Motor Humano*. Uma Abordagem Filialica. Guanabara Koogan.

Pons, R., & Arufe, V. (2016). Análisis descriptivo de las sesiones e instalaciones de psicomotricidad en el aula de Educación Infantil. *Psicología*, 37, 29–30. https://doi.org/10.1007/s10051-016-0170-2

García-Marín, P., & Fernández-López, N. (2020). La competitividad de las habilidades motrices en la educación infantil. *Apunts. Educación Física y Deportes*, 3(141), 21–32. https://doi.org/10.1016/j.apunts.2020.04.093

González-Gross, M., & Meléndez, A. (2013). Sedentarismo, active lifestyle and sport: Impact on health and obesity prevention. *Nutricion Hospitalaria*, 29(5), 89–98. https://doi.org/10.3305/nh.2013.28.sup5.6923

Goodway, J., Robinson, L., & Amui, H. (2007). Needs assessment of the object control skills of African American and Hispanic preschoolers who are at risk. *Journal of Sport & Exercise Psychology*, 29, 29–30.

Guillen, L., Rojas, L., Formoso, A. A., Contreras, L. M., & Estevez, M. A. (2019). Influencia de la estimulación temprana en el desarrollo sensorial - motriz de niños de cuatro a seis años: una visión desde el Karate Do. *Retos*, 35, 147–155. https://doi.org/10.1016/j.recyt.fecyt. index.php/retos/article/view/63104/40836

Iriarte, A., Pacheco, S., & Tapia, N. (2018). Desarrollo motriz de niños y niñas preescolares según índice de masa corporal normope, sobrepeso y obesidad de dos jardines dependientes de Junji, Viña del Mar. *Tesis de licenciatura, Pontificia Universidad Católica de Valparaíso*. http://oa.upm.es/41206/1/INVE_MEM_2015_227791.pdf

Rudisill, M. E., Garcia, C., & Garcia, L. E. (2008). *A developmental perspective on the role of motor skill competence in physical activity: An emergent research tradition*. *Quest*, 60(2), 290–306. https://doi.org/10.1007/s10362/2008.10483582

Valentini, N. C. (2012). Validity and reliability of the TGMD-2 for Brazilian children. *Journal of Motor Behavior*, 44(4), 275–280. https://doi.org/10.1080/00222895.2012.700967