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Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity

Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain

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ISSN-e 2386-8333

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Vol. 12, n. º 1; p. 1-20, January 2026 https://doi.org/10.17979/sportis.2026.12.1.11994

Descriptive analysis of psychomotor skills and road safety education in public and private preschool institutions in Ecuador

Análisis descriptivo de las habilidades psicomotoras y la educación en seguridad vial en instituciones preescolares públicas y privadas en Ecuador

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Editorial schedule: *Article received 25/04/2025 Accepted: 03/11/2025 Published: 01/01/2026*

https://doi.org/10.17979/sportis.2026.12.1.11994

To cite this article use the following reference:
Aldas Arcos, H.G.; Barreto Andrade, J.A.; Cobos Bermeo, N.A.; Moncada-Jiménez, J.; Delgado Espinoza, A.C.; Matute Farez, E.J. (2026). Descriptive analysis of psychomotor skills and road safety education in public and private preschool institutions in Ecuador. Sportis Sci J, 12 (1), 1-20 https://doi.org/10.17979/sportis.2026.12.1.11994

Author contribution: All authors contributed equally to the work.

Funding: The project with the code VIUC_XX_2024_14, was funded by the Vice-Rectorate for Research of the University of Cuenca, Cuenca, Ecuador.

Conflict of interest: The authors declare that they have no conflicts of interest.

Ethical aspects: The research with human participation was approved by the Ethics Committee for Research in Human Beings of the University of Cuenca (CEISH-UC), with code 2024-003EO-VIUC

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Abstract
During early childhood, children require ongoing psychomotor activities that stimulate their motor development, thinking, and perception, as well as their understanding of the environment for safe development. The objective was to analyze the level of psychomotor development and road safety education in 4- to 5-year-old schoolchildren from private and public educational institutions in the Cuenca canton of Ecuador. Methodology: A cross-sectional study with a mixed approach was conducted with the participation of 367 schoolchildren (195 boys, 172 girls). A psychomotor assessment test and an observation form were administered to assess road safety knowledge. ANOVA tests and Pearson's correlations were computed. Results: Regardless of the type of institution, women had higher scores on the total psychomotor test (M = 15.21 ± 3.68 pts.) than men (M = 14.35 ± 4.11 pts.; p = 0.038). Students from public institutions had lower scores on the total driver education test (M = 13.08 ± 3.43 pts.) than those from private institutions (M = 14.68 ± 2.93 pts.; $p \leq 0.0001$). In conclusion, it is evident that women showed better psychomotor skills, and students from private institutions presented better knowledge of driver education.
Key words: Child development; road safety; early childhood education; psychomotor skills

Resumen
En la primera etapa infantil, los niños requieren participar constantemente en actividades psicomotrices que estimulen su desarrollo motriz, pensamiento y percepción, así como la comprensión del entorno para un desenvolvimiento seguro. El objetivo fue analizar el nivel de desarrollo psicomotriz y educación vial en niñas y niños escolares de 4 a 5 años de instituciones educativas privadas y públicas del cantón Cuenca, Ecuador. Metodología: se realizó un estudio transversal, con un enfoque mixto, en el que participaron 367 escolares (niños = 195, niñas= 172). Se aplicó la prueba de evaluación psicomotriz y una ficha de observación para valorar el conocimiento en educación vial. Se calcularon pruebas de ANOVA y correlaciones de Pearson. Resultados: independientemente del tipo de institución, las mujeres tuvieron puntajes más altos en el total de la prueba de psicomotricidad (M= 15.21 ± 3.68 pts.) que los hombres (M = 14.35 ± 4.11 pts.; p = 0.038). Los escolares de las instituciones públicas tuvieron puntajes más bajos en el total de la prueba de educación vial (M= 13.08 ± 3.43 pts.) que los de las instituciones privadas (M = 14.68 ± 2.93 pts.; $p \leq 0.0001$). En conclusión, se evidencia que las mujeres mostraron mejores niveles de psicomotricidad y los escolares de instituciones privadas presentaron mejor conocimiento de educación vial.
Palabras clave: desarrollo infantil; seguridad vial; educación inicial; habilidades psicomotoras

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Introduction

Movement is essential for human development. If motor skills are appropriately developed during childhood, they will contribute to the autonomy necessary to create, maintain, and sustain strong relationships with the environment (Argos González et al., 2025). Therefore, psychomotor skills constitute a fundamental component in the comprehensive development of preschoolers because they allow for the connection between different dimensions of human growth. Practicing them not only contributes to physical development but also stimulates cognitive, social, and emotional capacities, ensuring the child's holistic development (Arufe Giráldez et al., 2021).

Psychomotor skills are divided into fine and gross motor skills, and as a whole, they encompass the movements of large muscle groups as well as the finer movements controlled by the central nervous system. Psychomotor skills include basic motor skills such as crawling, walking, rolling, and running, as well as balance, coordination, and body expression (Nielsen Niño et al., 2023). Psychomotor development is essential for physical performance and social inclusion in childhood (Roa González et al., 2019). This development improves physical, communication, well-being, academic, and social skills (Di Palma & Ascione, 2020; Ochoa Martínez et al., 2019). Villalva Cevallos et al. (2024) emphasize the impact of psychomotor development on emotional health and academic performance, primarily in attention and concentration. Likewise, Lahuerta-Contell et al. (2022) indicate that raising awareness among early childhood education teachers about the levels and patterns of physical activity in the classroom can improve the development of psychomotor skills during structured movement sessions. This approach makes more sense considering that, during early childhood education, a comprehensive and holistic approach to learning experiences is essential, prioritizing play, children's activity, and meaningful experiences in a safe and caring environment (Arufe Giráldez, 2020).

Childhood is a fundamental period that offers a unique window for the full development of a child's potential (Hascoët, 2024). During this stage, motor and cognitive foundations are forged, pillars for harmonious and lasting growth; there is an intrinsic connection between motor development and the ability to learn, which underscores the importance of psychomotor skills (Mora, 2023). Psychomotor skills also consider spatial orientation, which is an essential component of early childhood road safety education

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(Borrego-Balsalobre et al., 2021; Imbernón-Giménez et al., 2020; Marín-Escobar et al., 2022).

Thus, road safety education during early childhood becomes essential for internalizing safe and responsible habits. In this sense, Sailema-Torres et al. (2020) argue that acquiring road safety-related habits has a long-term impact on accident prevention, which is determined by factors such as parental behavior, sociodemographic environment, and formal education.

Globally, road accidents cause approximately 1.3 million preventable deaths and 50 million injuries annually, making them the leading cause of mortality among children and young people. Faced with this alarming reality, the United Nations General Assembly, through Resolution 74/299, proposes, in the Second Decade of Action for Road Safety (2021-2030), jointly with the WHO within the framework of Sustainable Development Goal 3.6 of the 2030 Agenda, to halve the number of deaths and injuries caused by traffic accidents worldwide. However, the number of studies on how to teach road safety education in the classroom is limited (Organización Mundial de la Salud, 2021; Villalva Cevallos et al., 2024). This effort underscores the urgency of implementing effective and sustainable measures to improve global road safety.

According to Ecuador's transport statistics (ESTRA), during the third quarter of 2024, the National Transit Agency (NTA) recorded 5,308 traffic accidents. Among the leading causes are: a) driver inexperience and recklessness, b) excessive speed, and c) failure to comply with traffic signs. The age range of the victims is between 18 and 29 years, although the deaths of 940 people under 18 years of age are also recorded (Instituto Nacional de Estadística y Censos, 2024). It is also known that the province of Azuay ranked third in injured people (7.09%), equivalent to 953 victims, and where Cuenca registered 767 victims, reflecting a high rate of affected people and underlining the need to implement educational interventions in road safety education aimed primarily at these regions (Instituto Nacional de Estadística y Censos, 2024).

In this regard, (Gounaridou et al., 2021) confirm that attention, responsible attitude, and pedestrian and driver behavior on the road are skills acquired through coordinated practice. Likewise, Zare et al. (2019) argue that parental involvement is an important strategy in designing educational programs based on active learning to improve

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schoolchildren's road behavior. Similarly, An and Shin (2023) and Kourmousi et al. (2024) agreed that well-designed comprehensive road safety education fosters preventive attitudes toward children's road safety.

In this context, Sailema-Torres et al. (2020) highlight the need and importance of developing multidisciplinary educational programs based on road prevention and safety in early childhood that contribute to children's comprehensive development. However, despite the efforts made, there is a notable lack of studies that delve into the development of coordination skills and road safety education in children aged 4 to 5, with particular attention to gender.

Likewise, the Ecuadorian Ministry of Education maintains that the curriculum did not address some important skills related to Road Safety Education and Sustainable Mobility; therefore, in 2024, it included these skills through Curricular Insertion (Ministerio de Educación del Ecuador, 2024b). Furthermore, universities must contribute to this context when training their students in Education programs to acquire the relevant competencies when practicing their profession (Ramírez González et al., 2023).

Internationally, various programs demonstrate the positive impact of implementing educational strategies on motor development and the promotion of road safety. Rojo-Ramos et al. (2022) highlight how specific interventions aimed at psychomotor development and road safety in early childhood can decisively contribute to the development of motor and preventive habits and skills; this indicates the relevance of adapting these experiences to local contexts such as that of Cuenca, Ecuador.

In this context, the present study aimed to understand psychomotor skills and road safety education in 4- to 5-year-old schoolchildren from the canton of Cuenca, Ecuador. This study aimed to demonstrate and establish the foundations for designing educational programs that promote comprehensive child development. Based on the above, the following question arises: What is the level of psychomotor skills and road safety education in 4- to 5-year-old schoolchildren in the canton of Cuenca, Ecuador, according to gender and type of educational institution?

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Materials and Methods

Design and Sample

We designed a cross-sectional study using a mixed quantitative-qualitative approach. The study population comprised 7,531 Early Childhood Education students aged 4 and 5. There were 3,643 boys (48.4%) and 3,888 girls (51.6%) from the canton of Cuenca, Ecuador (Ministerio de Educación del Ecuador, 2024a). The Raosoft software (Raosoft, Inc., USA) determined a sample of 367 male and female students using probability cluster sampling with a 95% confidence interval and a 5% margin of error.

The inclusion criteria were: a) educational institutions with more than 35 students enrolled in Early Childhood Education; b) students regularly attending classes; c) students whose parents or guardians agreed to sign the informed consent form to participate in the study; and d) Early Childhood Education students free from physical disabilities. Thus, prior to the start of the research, informed consent was obtained from the schoolchildren's legal guardians.

Ethics statement

The study protocol was submitted to the Human Research Ethics Committee of the University of Cuenca, and it was accepted on March 12, 2024, under code number 2024-003EO-VIUC.

Procedures

The children's legal guardians were required to complete an ad hoc affiliation form to record demographic data; this instrument was used to characterize the study sample. A modified version of the Capón Perceptual Motor Test battery (Capón, 1978) assessed the level of psychomotor development in children aged 4 to 5 years. The battery has shown evidence of adequate psychometric properties. According to Chui Betancur et al. (2024), the modified battery demonstrates good internal consistency, as assessed by Cronbach's Alpha (α = 0.865). The modified battery has also shown content-related validity (Flores Ferro et al., 2025). To complete the battery, the child must attempt each test three times.

The first test, called body part identification, involves positioning the child in front of the evaluator at a distance of approximately three to four meters. The child is instructed to close their eyes upon hearing the evaluator's instructions. Then, the evaluator asks them

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to locate different parts of their body (such as shoulders, hips, head, feet, eyes, elbows, mouth, and chest, among others) using their hands.

The second test assesses the balance on a bar or beam. The child must walk on a balance beam or bar, 3 meters long and 10 centimeters wide, placed on the floor. The child begins the course from one end and must move forward without stopping, keeping their gaze fixed on the palm of the examiner's hand, which is located at eye level.

For the third test, hopping on one foot, the child must balance on their right foot for three seconds, then perform three consecutive hops forward; this procedure is repeated with the left leg. In the fourth test, the hop and drop test, the child must stand on a jumping box (40 cm wide by 50 cm high) with their feet shoulder-width apart. The child is instructed to extend their toes slightly over the edge of the box and to perform a simultaneous hop with both feet.

In the fifth test, obstacle course, the child must overcome a series of obstacles, passing over a hurdle located at knee height without touching the top. They must then pass under another hurdle located 5 cm below shoulder height. Finally, the child must move laterally through a narrow corridor without touching the edges. Finally, in the sixth test, ball reception, the child stands facing the evaluator at a distance of 2.5 meters. The evaluator throws a ball forward and upward with both hands, and the child must catch it in the air. For this activity, an 18 cm diameter rubber ball is recommended.

The test measures the areas of body awareness, spatial awareness, balance, general coordination, and hand-eye coordination. The evaluation is achieved by recording data from six tasks, the sum of which determines the level of psychomotor development according to the following categories: Very good (24-22 pts.), Good (21-19 pts.), Acceptable (18-15 pts.), Fair (14-11 pts.), and Problems (≤ 10 pts.).

For the road safety education assessment, an *ad hoc* observation sheet recorded the knowledge of traffic regulations in children aged 4 to 5 years using traffic safety signs. The evaluation categories were: a) acquired, b) in progress, and c) not acquired. Expert criteria validated this instrument; three teachers with expertise in the area analyzed it in two stages. They identified the need for minor adjustments in the terminology, resulting in a final version of this instrument. The following road safety signs were used: stop, zebra crossing (i.e., pedestrian crossing), bicycle lane, pedestrian lane, and vehicle and

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pedestrian signals. These signs were posted on a wall in front of the child. The child was asked to identify the correct sign by naming each one. This test had only one attempt.

Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics, version 26. Descriptive statistics are presented as mean and standard deviation (M ± SD). Two-way ANOVA tests were performed for independent groups (type of institution by sex) for the traffic safety and psychomotor variables. When ANOVA interactions were statistically significant, Tukey's post hoc test was used to study simple effects. The precision of the differences between means is presented as the 95% confidence interval ($95\%CI_{diff}$), and statistical significance was defined a priori at $p \leq 0.05$. Finally, Pearson correlations were calculated between age and type of institution, and the driver education and psychomotor variables.

Results

The study included 367 participants (195 men and 172 women), of whom 230 were from public institutions and 137 from private institutions. Table 1 shows the psychomotor and driver education characteristics.

Participants from public institutions had a younger mean age (M = 4.69 ± 0.32 yr.) than those from private institutions (M = 4.83 ± 0.33 yr.) ($p \leq 0.0001$). Participants from public institutions had lower mean scores on the crosswalk test (M = 1.91 ± 0.99 pts.) than those from private institutions (M = 2.39 ± 0.87 pts.; $p \leq 0.0001$). Participants from public institutions had lower mean scores on the pedestrian traffic light test (M = 2.59 ± 0.85 pts.) than private institutions (M = 2.77 ± 0.62 pts.; $p = 0.021$). Participants from public institutions had lower mean scores on the bicycle-only lane test (M = 2.58 ± 0.84 pts.) than private institutions (M = 2.83 ± 0.55 pts.; $p = 0.002$). Finally, participants from public institutions had lower mean scores on the total driver education test (M = 13.08 ± 3.43 pts.) than those from private institutions (M = 14.68 ± 2.93 pts.; $p \leq 0.0001$).

Individuals from public institutions had lower mean scores on the body parts identification test (M = 2.34 ± 1.16 pts.) than private institutions (M = 2.78 ± 1.16 pts.; $p = 0.001$). Participants from public institutions had higher mean scores on the balance board test (M = 2.00 ± 0.91 pts.) than private institutions (M = 1.76 ± 0.83 pts.; $p = 0.008$). Participants from public institutions had lower mean scores on the one-legged hop test

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(M = 2.52 ± 1.12 pts.) than private institutions (M = 2.84 ± 1.15 pts.; p = 0.013). Furthermore, regardless of the type of institution, men (M = 2.50 ± 1.22 pts.) had lower scores than women (M = 2.79 ± 1.16 pts.; p = 0.014). Finally, regardless of the type of institution, women had higher mean scores on the total psychomotor test (M = 15.21 ± 3.68 pts.) than men (M = 14.35 ± 4.11 pts.; p = 0.038).

Table 1. Descriptive statistics for students from public and private institutions (n = 367).

	Private (n = 137)		Public (n = 230)	
Variable	Male (n = 70)	Female (n = 67)	Male (n = 125)	Female (n = 105)
Age (yr.)	4.81 ± 0.35	4.85 ± 0.33	4.70 ± 0.34	4.67 ± 0.30
Traffic Safety				
Stop sing	2.39 ± 0.87	2.01 ± 0.96	1.84 ± 1.00	1.90 ± 0.94
Crosswalk	2.46 ± 0.86	2.33 ± 0.91	1.89 ± 1.01	1.94 ± 0.97
Pedestrian Light	2.76 ± 0.62	2.79 ± 0.62	2.65 ± 0.84	2.51 ± 0.86
Bicycle Lane	2.87 ± 0.48	2.79 ± 0.62	2.55 ± 0.89	2.61 ± 0.78
Pedestrian Lane	2.30 ± 0.94	2.13 ± 0.98	1.83 ± 1.07	2.14 ± 1.08
Vehicle Light	2.23 ± 0.71	2.31 ± 0.80	2.30 ± 0.90	2.00 ± 0.90
Total	14.97 ± 2.84	14.37 ± 3.00	13.06 ± 3.59	13.10 ± 3.25
Psychomotor Skills				
Body Parts	2.76 ± 1.15	2.81 ± 1.18	2.28 ± 1.18	2.41 ± 1.14
Balance Board	1.73 ± 0.85	1.79 ± 0.81	1.88 ± 0.89	2.14 ± 0.92
One-Foot Hop	2.61 ± 1.16	3.07 ± 1.09	2.44 ± 1.25	2.61 ± 1.17
Hop and Drop	2.24 ± 1.06	2.45 ± 1.02	2.57 ± 1.24	2.61 ± 1.17
Obstacles	2.97 ± 1.15	2.94 ± 1.28	2.90 ± 1.22	3.10 ± 1.09
Ball	2.14 ± 1.09	2.40 ± 1.12	2.22 ± 1.10	2.17 ± 1.06
Total	14.46 ± 3.50	15.46 ± 3.45	14.29 ± 4.43	15.05 ± 3.82

An interaction was found between the type of institution and the participants' sex in the stop variable (p = 0.040). Follow-up analysis indicated that men from private institutions showed higher scores than men from public institutions (95%CI_{diff} = 0.27, 0.83 pts.) and that men from private institutions had higher scores than women from the same type of institution (95%CI_{diff} = 0.05, 0.69 pts.; Figure 1A). An interaction was found between the type of institution and the participants' sex in the pedestrian-only lane variable (p = 0.033). Follow-up analysis indicated that men from private institutions showed higher scores than men from public institutions (95%CI_{diff} = 0.17, 0.77 pts.) and that men from public institutions showed lower scores than women from the same type of institution (95%CI_{diff} = 0.04, 0.58 pts.; Figure 1B). An interaction was found between the type of institution and the sex of the participants in the traffic light variable (p =

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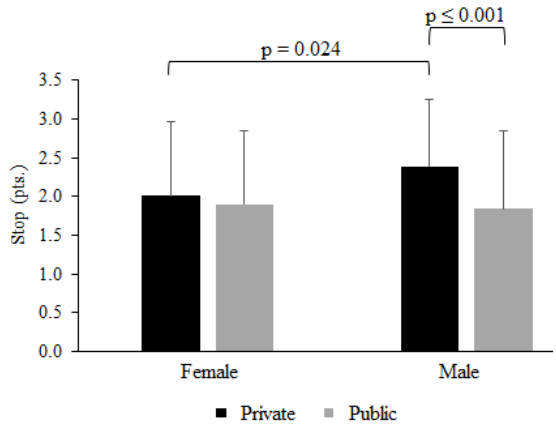
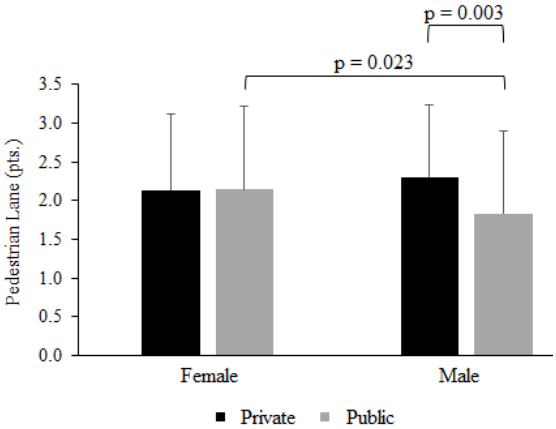
0.041). Follow-up analysis indicated that women from private institutions showed higher scores than women from public institutions (95%CI$_{diff}$ = 0.05, 0.57 pts.) and that men from public institutions showed higher scores than women from the same type of institution (95%CI*diff* = 0.08, 0.52 pts.; Figure 1C).

A



B



C

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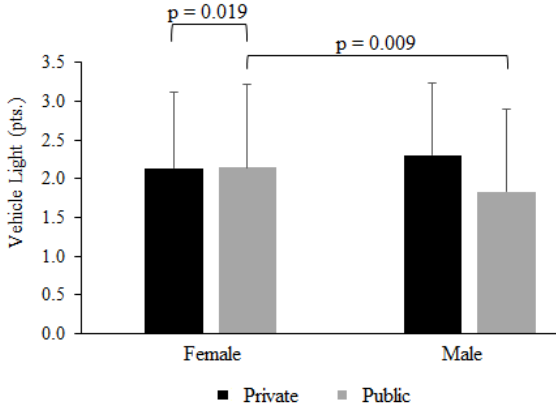

Figure 1 Interaction between the type of institution and the sex of the participants for the variable stop (Panel A), pedestrian-only lane (Panel B), and vehicle traffic light (Panel C)

The total score of the driver education test correlated significantly with age (r = 0.14; $p = 0.005$), type of institution ($r = -0.23$; $p \leq 0.0001$), stop sign ($r = 0.66$; $p \leq 0.0001$), zebra crossing ($r = 0.65$; $p \leq 0.0001$), pedestrian traffic light ($r = 0.62$, $p \leq 0.0001$), bicycle-only lane ($r = 0.53$; $p \leq 0.0001$), pedestrian-only lane ($r = 0.63$; $p \leq 0.0001$), and vehicle traffic light ($r = 0.61$; $p \leq 0.0001$). The total score of the psychomotor test correlated significantly with age ($r = 0.26$; $p \leq 0.0001$), sex ($r = 0.11$; $p = 0.018$), body part identification ($r = 0.62$; $p \leq 0.0001$), balance board ($r = 0.50$; $p \leq 0.0001$), one-foot hop ($r = 0.66$; $p \leq 0.0001$), jump and fall ($r = 0.60$; $p \leq 0.0001$), obstacles ($r = 0.62$; $p \leq 0.0001$) and ball ($r = 0.50$; $p \leq 0.0001$).

Discussion

This study aimed to analyze the level of psychomotor development and driver safety education skills in 4- to 5-year-old schoolchildren in the canton of Cuenca, Ecuador, according to sex and type of educational institution. The main finding of this study was that regardless of the type of institution (i.e., public or private), females showed better psychomotor development than males and that driver safety education knowledge among students from public institutions was lower in several tests than that of participants from private institutions.

Regarding the level of driver safety education knowledge, a study conducted in Peru by Eustaquio and Castillo (2018) is known, using an educational program designed to improve traffic accident prevention skills in fourth-grade students. This study used two

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instruments; the first revealed that prior knowledge about traffic accident prevention was low among most respondents (70%), and only 30% showed a high level. The second instrument showed that the majority of respondents (67%) had a negative attitude, and a minority (23%) had a positive attitude toward traffic accident prevention; that is, prior attitudinal learning was not ideal. These results differ from those achieved in the present study concerning private institutions; however, they are similar to those achieved in public institutions.

Another study conducted in Ecuador by Sailema-Torres et al. (2021) on the teaching and learning process of road safety education applied to 120 schoolchildren aged 5 to 6 years. In that study, road safety education questions were contextualized to the characteristics of the students, and it was found that 75.88% of the answers were correct and 24.12% incorrect. These results are similar to the present study's, as most students showed "acquired knowledge." A similar study was conducted in Bogotá, Colombia (Peralta, 2023). The study addressed the topic of road safety education as a pedagogical setting for children and adolescents. The program was titled "Wheels and Steps on the Asphalt," among the most relevant findings was that providing road safety education during preschool and secondary education is not a priority for the state and is not included in institutional educational plans. This conclusion is relevant to the present study, as a similar situation occurs in Ecuador, which was one of the reasons for conducting this study.

In contrast, in European countries, there is evidence of more precise and specific research, such as the use of bicycles to assess whether skill on a bicycle is considered independent within basic motor skills or the verification of the viability of school programs with bicycles in Physical Education classes or with active transportation (Canosa Pasantes et al., 2024). In countries such as Spain, accident prevention content is developed within the Early Childhood Education and Physical Education curricula, determining that the comprehensive approach and interdisciplinary projects have been practical and pedagogically recommended (Peixoto-Pino et al., 2019).

Fernández-Menéndez and Fernández-Río (2018) developed a teaching unit to promote healthy habits. Among the activities covered was road safety education, which was used to develop safe citizens who respect shared spaces and road safety regulations.

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The researchers found problems with road safety education and traffic congestion among road users, which confirmed the need to implement road safety education programs consistently. Although the methodology employed differed from that used in the present study, it is concluded that learning road safety rules and signs is essential from the early years of schooling.

Regarding psychomotor development, a study by Borrego-Balsalobre et al. (2021) in Murcia, Spain, analyzed the psychomotor profile of 82 preschool children using the Psychomotor Assessment Scale for Preschoolers. The scale assessed the following areas: locomotion (L), positions (P), balance (B), leg coordination (LC), arm coordination (AC), hand coordination (HC), body schema self-awareness (BSA), and body schema awareness of others (BSAO). Based on the scores, the individuals' psychomotor development was categorized as: low (does not do it), normal (does it sometimes), and good (does it always). The psychomotor level of 3-year-old students was good in the L, P, B, and LC dimensions, and categorized as normal in AC, HC, BSA, and BSAO. Regarding the low score, very few 3-year-old students were at that level. At 4 years, L, P, B, and BSAO were good, reaching the normal level in the LC, AC, HC, and BSAO dimensions. The low score is small in all dimensions except BSA (18.3%). For 5-year-old schoolchildren, the good level includes the dimensions L, B, BSA, and BSAO; the normal level includes the dimensions P, LC, AC, HC, and BSA. Analyzing the low level, this is found in all dimensions except AC. These results are similar to those found in our study in the moderate positive correlation ($r = 0.26$), indicating that the higher the age, the better the psychomotor performance. This reality is far from what happens in Latin American countries such as Ecuador, as there are few studies on road safety education in preschoolers. For instance, a study was conducted in Peru on recreational activities for psychomotor development in early childhood children (Chui Betancur et al., 2024). The researchers used the Capón Test and reported total motor development scores of 15.48 ± 1.23 points before the implementation of recreational activities; these total scores are very similar to those achieved by the girls in the present study (15.21 ± 3.68 points) but lower than those of the boys (14.35 ± 4.11 points), regardless of the type of institution. However, if each test is analyzed, it can be seen that the values determined in the body scheme (2.82 ± 0.58 pts.), balance (2.60 ± 0.66 pts.), jump and land (2.61 ± 0.74

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pts.), ball reception (2.61 ± 0.48 pts.), hopping (2.84 ± 0.35 pts.) are slightly higher than those achieved in the present study; except in the obstacle course (2.17 ± 0.88 pts.).

Along the same lines, Alonso-Vargas et al. (2022) conducted a study on the relationship between learning and psychomotor skills to describe and compare psychomotor levels in children in the second cycle of early childhood education. To assess psychomotor skills, they used the Movement Assessment Battery for Children-2 (MABC-2), which includes eight tests assessing manual dexterity, catching and throwing, and balance. The mean values for manual dexterity in children aged 4 to 5 were 0.92 ± 0.21 pts. and 0.93 ± 0.21 pts., respectively. Regarding catching and throwing, they were 0.58 ± 0.32 pts. and 0.60 ± 0.41 pts., respectively. Meanwhile, balance scores were 0.60 ± 0.26 pts. and 0.73 ± 0.29 pts., respectively. These findings suggest that, at the motor level, manual dexterity is the main factor developed. These values, mainly for catching, throwing, and balance, are lower than those obtained in the present study.

Likewise, in the study by Parrado Merino et al. (2020) on the evaluation of motor coordination in preschoolers who used the same assessment instrument (MABC-2 Battery) as other studies, they determined that the highest results (in percentiles) were achieved in the balance test (mean = 32.35), manual dexterity (mean = 25.07), and aiming and catching (mean = 17.07). These values are similar to or slightly higher than those in the present study. It is worth mentioning that motor skills developed through intervention programs, which are structured, specific, and implemented by a Physical Education specialist, make children more likely to improve this skill (Navarro-Patón et al., 2024).

Conclusions

In conclusion, the results of this study reveal differences between 4- to 5-year-old students from public and private institutions in the canton of Cuenca, Ecuador, in aspects of psychomotor development and driver education. It is revealed that the scores of students from public institutions were lower than those of their counterparts from private institutions, which influences the development of the aforementioned variables. Thus, in driver education, students from public institutions achieved lower scores than those from private institutions on the zebra crossing, pedestrian signal, and bicycle lane tests. Consequently, students from private institutions may have better development, likely due to better infrastructure and better educational resources, among other factors.

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Regarding gender differences, regardless of the type of institution, girls scored higher on psychomotor tests than boys. The sex difference reinforces the view that girls at this school stage have greater psychomotor development than males. However, children from private institutions achieved better results than those from public institutions, suggesting that the type of institution influences the level of psychomotor development.

Interactions were also found between the type of institution and gender in several driver education tests, suggesting that these two factors are fundamental to student performance. Likewise, a positive correlation was found between age and driver education performance, suggesting that older children better understand traffic regulations. Finally, the results show that quality educational programs should be implemented to strengthen psychomotor development and driver education knowledge, especially in public institutions with lower performance values.

Strengths and limitations

The present study has strengths and limitations. A strength of the study is the descriptive design and the appropriate sample size since they provide with a clear view of phenomena, enabling the identification of patterns, trends, and characteristics of a specific population (i.e., preschool children from Cuenca, Ecuador). The potential study limitation was also the cross-sectional design. It is known that cross-sectional descriptive studies are unable to establish causal relationships between variables. They are often subject to observational or sampling bias, which can affect the external validity of the results. Therefore, experimental or correlational studies must be followed to obtain more in-depth and substantiated conclusions.

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