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SHORT REPORT OF ORIGINAL RESEARCH

Motor proficiency and accident proneness of preschool children

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Abstract

Children are particularly vulnerable to incidents because of their physical, psychological and behavioral characteristics. As a consequence, injuries are frequent and happen in children's daily life. The purpose of the current research was to identify the relationship among factors like motor proficiency, accident proneness and injury severity in preschool children. During 2007-2009 an accident surveillance questionnaire was sent to 60 nursery schools of East Macedonia and Thrace (Greece). The total sample of the study was 849 accident reports. Student Injury and Incident Report for use in Swedish Schools questionnaire (Laflamme et al., 1998) was used for the recording of the accidents. Children who had more than one accident in a single school year were detected and tested at the beginning of next school year with the battery ''Bruininks-Oseretsky Test of Motor Proficiency'' (Bruininks, 1978). Two way analysis of variance (two way ANOVA) was applied for analyzing data. The main effect of the factor "number of accident" was the declined in the balance ability ($F=7.61$, $p<.001$) at the school year 2007-08. Furthermore, the factor "number of accidents" effect, for the same reason as previously, the response speed ($F=12.3$, $p<.001$). Children who had minor severity of injury were significantly better than children who had severe injuries in the balance ($F=8.09$, $MD=4.57$, $p<.001$), in strength ($F=12.19$, $MD=4.59$, $p<.001$), in visual- motor control ($F=21.49$, $MD=6.7$, $p<.001$) and in upper-limb and dexterity ($F=12.32$, $MD=5.76$, $p<.001$). Similar results also indicated during the school year 2008-09 in balance ($F=8.45$, $MD=8.23$, $p<.001$) and in response speed ($F=14.11$, $MD=3.95$, $p<.001$). In conclusion children with poor motor performance represent accident proneness.

Key words: Motor Skills, Motor Coordination, Clumsiness

Introduction

A large number of accidents in childhood often cause serious disabilities and sometimes leads to loss of life. It is well recognized that school constitutes an environment where a major proportion of injuries occur (Laflamme, & Eilert-Petersson, 1998; Lenaway, Ambler, & Beaudoin, 1992; Schelp. Ekman, & Fahl, 1991), which are related to several factors such as gender, age, developmental status, behavior problems etc. (Rivara, 1995). Particularly, in preschool age, which is considered as an important period of life, a high number of accidents occur (Kunz, 1993); therefore causes need further research.

Furthermore, little is known about motor proficiency as one of the factors that contribute to an accident (Kunz, 1993; Plumert, 1995). Plumert "blames" high motor proficiency as a factor related with accidents (Plumert, 1995). On the other hand, only a limited number of studies have examined poor motor proficiency as a factor contributing to accidents. Specifically, only two studies have mentioned that poor motor proficiency is responsible for some accidents in preschoolers aged 4-6 years old (Kunz, 1993; Kambas, Antoniou, Xanthi, Heikenfeld, Taxildaris, & Godolias, 2007). Therefore, the purpose of the present study was to investigate the relationship among factors like motor proficiency, accident proneness and injury severity in preschool children.

Method

An accident surveillance questionnaire was sent over a 2-year school period (2007-2009) to 60 nursery schools of East Macedonia and Thrace (Greece). Regarding the number of the questionnaires received, the total sample of the study was 849 accident reports. For the recording of the accidents that took place in the school environment, the ''Student Injury and Incident Report for use in Swedish Schools'' questionnaire (Laflamme, Menckel, & Aldenberg, 1998) was used (Table 1).

Table 1. Brief summary of "Student Injury and Incident Report for use in Swedish Schools" (Laflamme et al., 1998) questionnaire

Personal data
Time of accident
Place of accident
Surface (type and condition) of the playground
Type of last activity
Presence/absence of an adult
Organized activity by an adult
How the accident occurred
The injured body-parts and the way of injury
The external factors that contributed to the accident
Other factors that contributed to the accident
Accident because of interaction with other people (with or without intention)
Post-accident actions and care

Children who had more than one accident in a single school year were detected and tested at the beginning of next school year with the battery ''Bruininks-Oseretsky Test of Motor Proficiency'' (Bruininks, 1978) (Table 2). One hundred ninety five preschool children were evaluated in the period of 2007-2008 and 211 in the very next year.

Table 2. Brief summary of "Bruininks-Oseretsky Test of Motor Proficiency" battery tests (Bruininks, 1978)

Ability/subtest	Number of tests
Running Speed and Agility	1
Balance	8
Bilateral Coordination	8
Strength	3
Upper Limbs Coordination	9
Response Speed	1
Visual- Motor Control	8
Upper- Limb and Dexterity	8

Children's classification was performed according to: (a) number of accidents (1-10), (b) performance (1-10) and (c) accident severity (1-3). In order the accident severity to be determined, the scale reported by Alkon, Genevro, Tschann, Kaiser, Ragland, & Boyce, (1999) was used:
Minor: superficial lacerations, bumps, bruises, bites.
Moderate: deep lacerations, crush injuries, multiple cuts, burns, chipped teeth, fractures or minor injuries requiring medical attention or telephone contact with parents.
Severe: injuries at the moderate level that also required medical attention, telephone contact with parents or both.

Results

Data were analyzed through a two way analysis of variance (two way ANOVA). Independent variables were: the number of accidents (1: 2-4, 2: 5-7, 3: 8-10), accident severity (1: minor, 2: moderate, 3: severe). Dependent variable was the score in BOTMP test (in the two different measures). When a significant effect was found, post hoc analysis was performed through the Sidak test. Differences were considered statistically significant at $p< .05$. The main effect of the factor "number of accident" was the declined in the balance ability ($F=7.61$, $p<.001$) at the school year 2007-08. This effect was due to superiority of 1st class

children vs. 3rd class children (MD=8.23, p<.001). Furthermore, the factor "number of accidents" effect, for the same reason as previously, the response speed (F=12.3, p<.001).

At the same school year statistical analysis revealed a significant effect of the factor "severity of accident" in motor proficiency and showed that between the 1st and 3rd class (minor vs. severe) was a great performance variation. Particularly, this study showed that children who had minor severity of injury were significantly better than children who had severe injuries in the balance (F=8.09, MD=4.57, p<.001), in strength (F=12.19, MD=4.59, p<.001), in visual- motor control (F=21.49, MD=6.7, p<.001) and in upper- limb and dexterity (F=12.32, MD=5.76, p<.001). Finally, at the total performance of motor proficiency were statistically significant differences (F=71.04, p<.001) between 1st and 2nd class (MD=14.2, p<.001) and between 1st and 3rd class (MD=33.21, p<.001). During the school year 2008-09 in balance (F=8.45, MD=8.23, p<.001) and in response speed (F=14.11, MD=3.95, p<.001), where the children of 1st class had better performance in comparison with children of the 3rd class.

Finally, during the school year 2008-09, the effect of the factor "severity of injury" in motor proficiency revealed no difference compared with the effect of the school year 2007-08. Children with minor severity injury indicated statistically better performance compared with the other children (severe and moderate injury) in balance (F=9.51, MD=3.99, p<.001), in strength (F=15.3, MD=4.21, p<.001), in visual – motor control (F=36.55, MD=5.94, p<.001) and in speed and in upper- limb and dexterity (F=15.44, MD=5.31, p<.001). In the total score were statistically significant differences between 1st and 2nd group MD=15.7, p<.001) and also between 1st and 3rd group.

Discussion

The results revealed that children with poor motor performance represent *accident proneness*. Although it is well documented that these children avoid participating in motion activities (Zimmer, 2006) when they are forced by the circumstances to move then they have a high risk of accident. This finding is in agreement with reports correlating the poor score in motor performance test and accident proneness in children with DCD (Peters, Barnett, & Henderson, 2001) or ADHD (Barkley, 2002). However, Plumert (1995) and Gofin, Donchin, & Schulrof (2004) declared that children with good motor performance get injured more frequently because of the risks that they take.

Moreover, most of the children with poor motor performance represent high injury severity after an accident. It should be noted that current findings regard to the total score of motor performance, while the individual controls showed that the four determinant skills are: balance, strength, the visual-motor control and the upper- limb and dexterity. This latter finding may be correlated with the neuromuscular maturation or with the absence of adequate stimulations or with personal characteristics such timidity, hesitation, etc.

It is obvious that further research is needed to determine the relationship between the severity of injuries and the level of motor performance, as well as between motor performance and accidents. However, it seems that the attempt to adapt a model of prevention of accidents not only will improve the motor performance in children with "accident proneness" but it will probably contribute to a safer school environment.

This attempt could be a part of a generalized plan of risk management or accidents, including a series of actions such as corrective interventions to existing places in school environment, redesigning-replacement of dangerous sport or educational equipments in order to prevent and reduce the risk of school accidents.

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