

pedestrians, road traffic, road accident

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DEFINITION OF SPEED MOVING CHILDREN IN THE ASPECT OF ROAD ACCIDENTS – PRELIMINARY RESEARCHES

Summary. In the article the initial results of research were presented which were conducted in order to define the speed of movement of pedestrians in road traffic. School-age children were chosen as the research material. The tests were conducted for movements of a different speed: slow walking, normal walking, fast walking and running. The speed values achieved in the conducted tests enable the precise definition of time when the pedestrian stays on the road. As a consequence they enable the checking of the possibilities to avoid running the pedestrian over by the driver and their mutual influence on the occurring road accident.

OKREŚLENIE PRĘDKOŚCI PORUSZANIA SIĘ DZIECI W ASPEKCIE WYPADKÓW DROGOWYCH – BADANIA WSTĘPNE

Streszczenie. W artykule przedstawiono wstępne wyniki badań mające na celu określenie prędkości poruszania się pieszych w ruchu drogowym. Jako materiał badawczy wybrano dzieci w wieku szkolnym. Badania przeprowadzono dla ruchu o zróżnicowanym tempie: chód wolny, chód normalny, chód szybki, bieg. Wartości prędkości otrzymane w wyniku przeprowadzonych badań dają możliwość precyzyjnego określenia czasu przebywania pieszego na jezdni. W konsekwencji umożliwiają sprawdzenie możliwości uniknięcia potrącenia pieszego przez kierowcę oraz ich wzajemnego przyczynienie się do zaistniałego wypadku drogowego.

1. INTRODUCTION

The reconstruction of the road accident is a complex process where the legal and technical issues are taken into account. It leads to the reconstruction of the course of either the whole road accident or its fragments [1÷6]. Each accident is a single and unique occurrence. Due to that fact, its reconstruction is a process which has no unified model. The person performing the reconstruction needs often to use the literature knowledge, results of the experimental tests or conclusions resulting from the overall analysis of the processes occurring in road traffic.

The important element of the reconstruction process is the use of traces collected in the area where the accident occurred and the assessment of the real road and atmospheric conditions as well as the possibility of what affects in the surrounding on the course of road accident [3].

The basic aim of the reconstruction process is the reconstruction of the behaviour of the road accident participants who could have influenced the occurrence and the course of the accident. In this

aspect the reconstruction process should take into account the functioning of the system (human – vehicle – surrounding) [4].

It is very important to use in the accident reconstruction as much information from the possessed ones as possible. They should be transformed into parameters describing the behaviour of the accident participants or only to those having influence on the course of this particular accident [2].

The final aim of the whole reconstruction process is the reconstruction of the course of the accident itself, which is the movement of the objects and the human actions in the course when it lasted. Usually, such process leads only to the estimation of the parameter values describing the movement of the objects, which is the marking of the probable range in which the values of the searched parameters fits (the speed of the vehicles before braking, their position etc.).

The court statement on committing a crime or being innocent in reference to a driver is often dependent exactly on the assumed reconstruction calculations of the movement speed of the pedestrian.

2. DESCRIPTION OF THE RESEARCH

The basic aim of the research was the statistic marking of the average movement speed of the pedestrian – children, taking into account the sex and the pace of movement. The achieved results are the main factor conditioning the possibility to define the probable time when the pedestrian is on the road from the moment of danger stage appearance to the moment of accident. As a consequence the tests enable to set the possibility of avoidance of running into a pedestrian and thus serve as a significant help source in defining the perpetrator of the occurrence. In practice it can be applied in a situation when the possible accident witness is able to define the pace of the pedestrian entering the road just before the contact with the body of the vehicle. The authorised expert analysing a case is then able to define the probable speed of the pedestrian on the basis of the available test results.

The tests were conducted in an elementary school, lower-secondary school and upper-secondary school. In each of the mentioned schools they were conducted in the same way and were performed during Physical Education lesson in presence of the teacher in charge of those classes.

The tests of the movement speed were based on measuring the time of walking a 7-metre-long road section. The measurements were done for 4 types of paces: slow walking, normal walking, fast walking and running. The differences between the types of pace together with their written description were presented to the tested group before the beginning of the measurements. Each of the tested people assessed individually which type of movement is for them the given pace type.

Each of the measurements were taken twice – for movement from standing position and for movement from moving position. Moving from a standing position means that a pedestrian, before entering the road, was not moving, whereas moving from a moving position means that the pedestrian before entering the road was moving at the same pace.

In case of tests for start from standing, the person stopped before the line marking the beginning of a seven-metre measurement section and on a mark to start was moving at a given speed type up to the point of the finish line. Measuring of the non-uniform movement, in which the time needed to accelerate to a needed speed and keeping the even speed level was taken into account up to the point of crossing the finish line.

In case of testing for the moving start, the person was standing about 3÷5 before the start line and after being given a mark to start they started moving in the given speed up to the finish line. This type of speed testing was to eliminate from the measurement the time needed to accelerate to the given pace. The acceleration occurred before the measurement section and on the section the uniform speed was kept.

The measurements were taken with the use of stop-watch with the measurement precision of 0.01 [s].

The test results were registered with division to sexes and ages of children.

The tests were conducted on 434 children, including 228 girls and 206 boys.

3. RESULTS OF THE RESEARCH

Influence age of pedestrian (child) on the average value of speed moving was presented on the figures 1 ÷ 4.

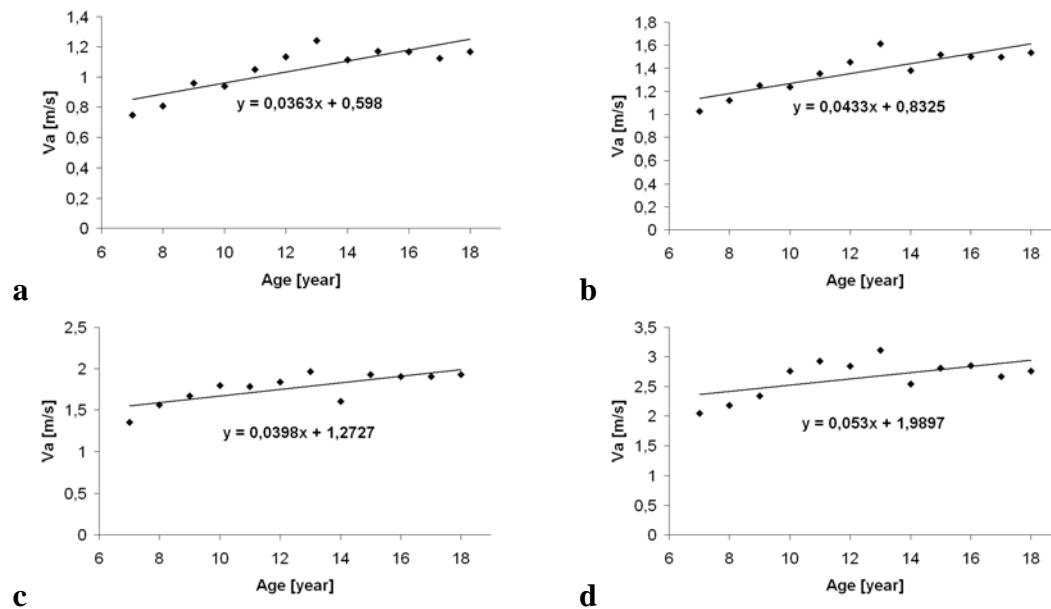


Fig. 1. Dependence of the average value of speed moving girls on their age – results for movement from standing position, a – slow walking, b – normal walking, c – fast walking, d – running

Rys. 1. Zależność średniej prędkości ruchu od wieku dziewczynek – wyniki dla „startu zatrzymanego”, a – chód wolny, b – chód normalny, c – chód szybki, d – bieg

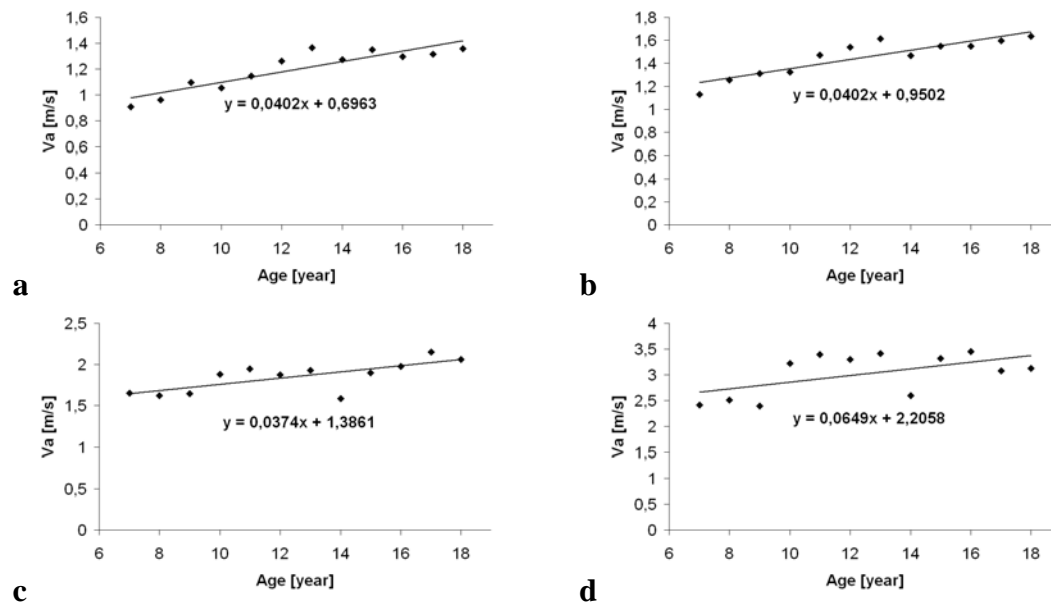


Fig. 2. Dependence of the average value of speed moving girls on their age – results for movement from moving position, a – slow walking, b – normal walking, c – fast walking, d – running

Rys. 2. Zależność średniej prędkości ruchu od wieku dziewczynek – wyniki dla „startu ruchomego”, a – chód wolny, b – chód normalny, c – chód szybki, d – bieg

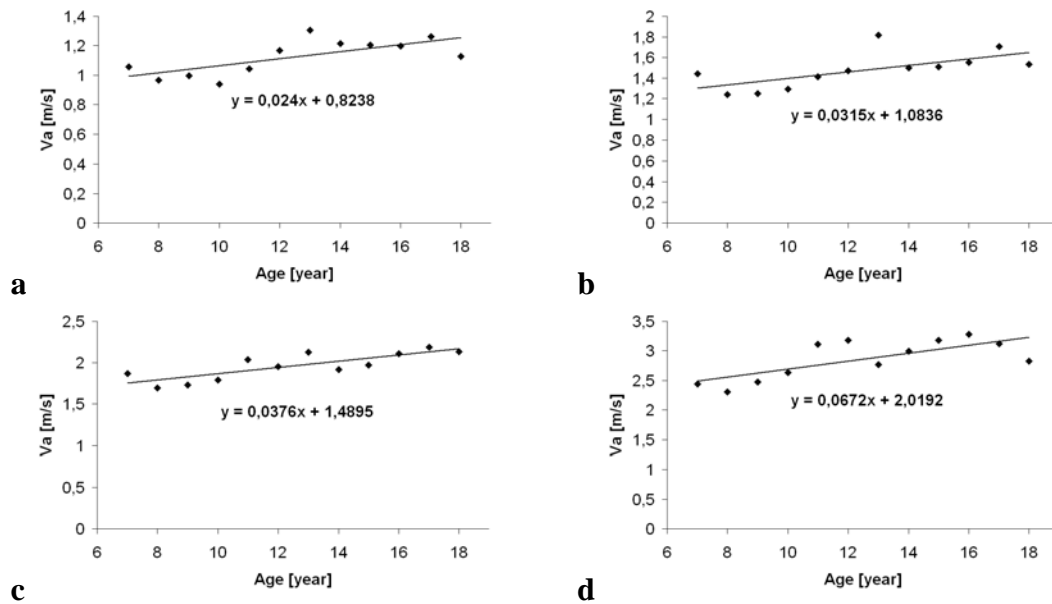


Fig. 3. Dependence of the average value of speed moving boys on their age – results for movement from standing position, a – slow walking, b – normal walking, c – fast walking, d – running

Rys. 3. Zależność średniej prędkości ruchu od wieku chłopców – wyniki dla „startu zatrzymanego”, a – chód wolny, b – chód normalny, c – chód szybki, d – bieg

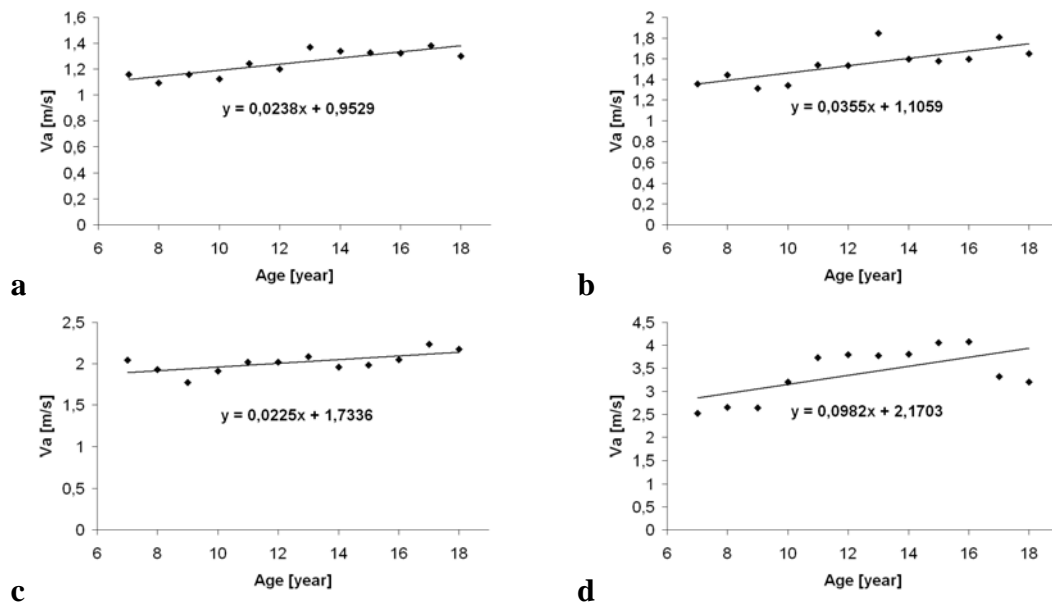


Fig. 4. Dependence of the average value of speed moving boys on their age – results for movement from moving position, a – slow walking, b – normal walking, c – fast walking, d – running

Rys. 4. Zależność średniej prędkości ruchu od wieku chłopców – wyniki dla „startu ruchomego”, a – chód wolny, b – chód normalny, c – chód szybki, d – bieg

4. CONCLUSION

The achieved results show the directly proportional dependence of the movement pace of children on their age, independently from the sex and the individually defined by the tested person type of the movement pace.

Independently from the tested movement pace and the way of moving (from a stop start and a moving start), the boys achieved higher speeds than the girls – the differences were from 0.01 [m/s] to 0.6 [m/s] (0.04 [km/h] ÷ 2.2 [km/h]) depending on the movement speed and a given age group.

The higher speed of pedestrian movements was achieved from a moving start than from a stop start, independently from the age group, sex and moving pace. The differences varied from 0.01 [m/s] ÷ 0.88 [m/s] (0.04 [km/h] ÷ 3.2 [km/h]) depending on sex, a given age group and the movement speed.

The subjective differences shown by the tested children between the slow walking, normal walking and fast walking range from 0.2 [m/s] to 0.6 [m/s] (0.7 [km/h] ÷ 2.2 [km/h]), whereas between fast walking and running 0.7 [m/s] ÷ 2.1 [m/s] (2.5 [km/h] ÷ 7.6 [km/h]) depending on age group, sex and the movement type (from a stop start and a moving start).

The speed marked in tests enable to define more precisely the danger time, when the child was on the road or near it and at the same time may have been or should have been noticed by a driver of a closing vehicle. The result of the assumed speed of the movement of a child in the reconstruction calculations will state if a driver had the physical ability of avoiding the accident. As a consequence, it will help the court to put the blame on the right person, being the one really responsible for running into a child on the road.

During researches, additional parameters connected with moving pedestrians were estimated. Next researches will show, if it is possible to use the artificial intelligence methods to speed moving definition for the process of road accidents reconstruction.

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