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MOBILE APPLICATION FOR TESTING FINE MOTOR SKILLS OF CHILDREN

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It is known that fine motor skills such as touching, grasping, and object manipulation can be defined as coordination of small muscle movements, usually finger-movements, that occur in coordination with the eyes [1-2].

The latest studies concerning the development of fine motor skills in children indicate that the abilities which include the use of hands develop over time, starting with primitive gestures such as grabbing at objects to more specific activities that require precise hand-eye coordination [3-5]. Fine motor skills are skills that involve a refined use of the small muscles controlling the hand, fingers, and thumb. The development of these skills allows one to be able to complete tasks such as writing, drawing, and buttoning [5-7].

As known, "basic" fine motor skills gradually develop and are typically mastered between the ages of 6-12 in children. These skills will keep developing with age, practice, and the increased use of muscles while playing sports, playing an instrument, using the computer, and writing [8-14].

A lot of tests for development fine motor skills for children based on manipulation of small objects with identification their shape, size, and weight. By engaging in hands-on play the child learns that some objects are heavy, requiring more force to move them; that some are small, easily slipping through the fingers; and that other objects come apart and can possibly be put back together again. This type of activity is crucial for the development of the child's fine motor skills [8-10].

Kids aged 5 to 7 years have been the fine motor skills will be developed to a much more powerful level, and are now being refined. As the child interacts with objects, the movements of the elbows and shoulders should be less apparent as the movements of the wrist and fingers. There are still gender differences in the development of fine motor skills. From the ages of 3-5 years old, girls advance their fine motor skills more than boys. Girls develop physically at an earlier age than boys; this is what allows them to advance their motor skills at a faster rate during prepubescent ages. Boys advance in gross motor skills later on at around age 5 and up [1-14].

The general scientific issue is the timely development of fine motor skills of children because they will show signs of difficulty controlling coordinated body movements with the hands, fingers, and face. Children may also show signs of difficulty with tasks such as cutting with scissors, drawing lines, folding clothes, holding a pencil and writing, and zipping a zipper.

Nowadays a lot of children use digital devices: smartphones, graphics and touchscreen tablets, laptops. These gadgets are comfortable and ergonomic for enjoyment, playing, and generally applying. That's why we proposed dynamic tests for developed fine motor skills as a mobile application like games for children. The testing process is execution different tasks with low-level and high-level complications - reiteration of the fingers of the trajectory of the object movements. Fig. 1 demonstrates a schematic example of testing on the touch screen of the smartphone.

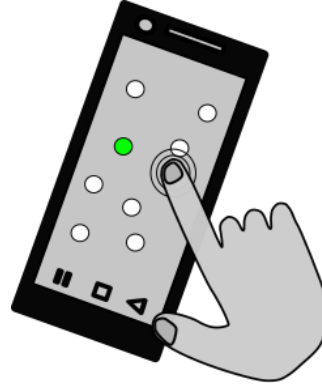


Figure 1 – A schematic example of testing on touch screen of smartphone

Different trajectories were programmed in corresponding the movement of a figure in the Cartesian coordinate system starts from the initial $(0;0)$, with a step $h=5$ pixels and a random velocity of motion $v(X)$ and $v(Y)$, on a segment $[-5; 5]$ is given by the following expression [3]:

$$\begin{cases} x = x + v(X) \\ y = y + v(Y) \end{cases} \quad (1)$$

Fig. 2 represents an example of a developed dynamic test - the movement of a ball along a specific trajectory. It is interesting for execution specifically by children. Tests have settings about the adaptation of the background, count of objects and their size and color, etc. A different configuration of tasks allows execution of game for each finger right or left hand separately.

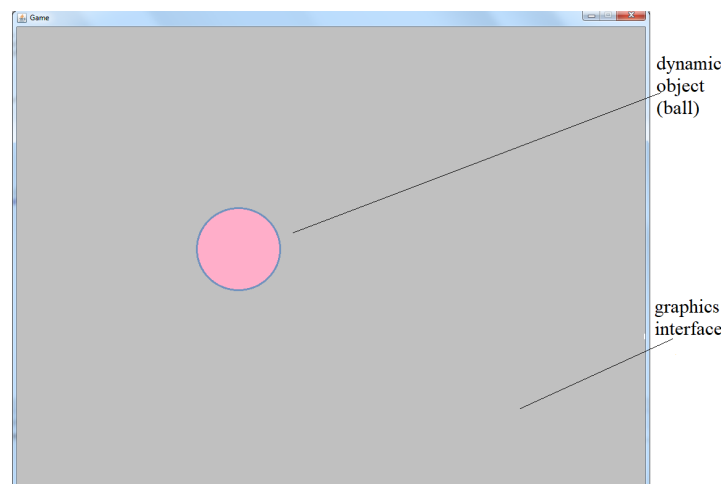


Figure 2 – A sample of developed game for testing fine motor skills [3]

The mobile application has been adapted for children enables develop fine motor skills by registering basic physical parameters during testing. The subsequent stages of research are experimental studies with children of different age categories. In addition, the development of specialized tests based on the current performance of fine motor skills is an important scientific task.

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