

A computer based rating system for testing motor performance in children

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Introduction

Motor fitness tests of children show that up to 35% of the children have a poor motor fitness at schoolstart [5]. In our own studies about posture problems of schoolchildren we found that up to 40% of the children also had coordination problems [1,2]. The basis of our findings were videos which we had taken of posture, spinal movement and some overall body movements, that allow an insight into the diversity of movement behavior. In order to evaluate the videos in regards to coordination problems, we use a computer based rating and documenting system that allows to analyze the main individual movement characteristics.

Methods

Our rating system is based on the performance of six basic movements: walking, running, standing and jumping on one leg, side jumping on both legs and a jumping jack (see Figure 1). These movements are filmed by video.

In order to carry out the ratings the film sequences (test-movements) along with (up to 10) pictures (special positions for documentation of movement problems) are transferred to the computer.

For each test-movement, more than 80 characteristics can be rated. These characteristics are grouped into five main-parameters: *personality in motion*, *posture*, *movement-pattern*, *quality of movement*, *coordination*, *coordinative abilities*, and *motor-characteristics*. An additional group documents *special signs* such as a fixated or rotating arm or extra movements (see Figure 2).

The rating takes place on a four point scale but in contrast to most of the test systems of today the rating takes place by analyzing movement parameters - and posture parameters. In doing this each chosen parameter contributes to the rating of a single characteristic, the associated main parameter and the coordination as a whole. This means you don't have to judge a movement by counting how often one can perform it in a given time or by assessing the quality of the movement. For example by choosing the "inward rotated foot" (test-movement *walking*) of the associated menu (foot) a weighted contribution of "minor problems" to the main parameter *posture* is made. A weighted sum of all the rated parameters then allows the quantification of the motor performance itself.

In order to achieve an exact individual analysis, all items that apply to the specific movement should be considered. This is a time consuming process, so there is also a "short-cut" incorporated into the program. In most cases a rating of up to 10 relevant parameters per test-movement is sufficient. These parameters we call *checkpoints* (see Figure 2). By choosing a test movement these *checkpoints* are displayed and allow an efficient way to analyze a motor performance.

The coordination profile documents the intra-individual differences regarding the different test movements and the evaluation of the main parameters as mentioned above. Additionally an individual "strength-weakness" profile of the tested child is available.



Figure 2. Rating window - jumping on both legs.

Results & Discussion:

Using this system, a study was done to evaluate the motor performance of Styrian schoolchildren (N=20) from the ages of six to ten years. Coordination weaknesses were found in 55% of the children whereas only 25% showed excellent coordination. Coordination problems were found in only 5%. As expected, such weaknesses were frequently found in the complex exercises jumping jack (see Figure 3) and jumping on both legs.



Figure 1. Test-movements.



Figure 3. *Jumping Jack – coordination problems*

In this first field-test, this system proved to be an effective tool for the examination and description of motor coordination. The findings (as far as comparable) were in good correlation with data from literature [3-6]. The interaction of the various parameters will be part of future tests. An additional help function by means of a film and picture database with case studies is being prepared, as well as special exercise programs for children with coordination problems.

Conclusion

With this coordination testing system, it is possible to evaluate individual characteristics as well as the testing of the overall motor performance. Thus, one can take care either of individual weaknesses or support good motor abilities.

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