

The APP-Coo-Test: a new method for assessment of coordination of upper limbs in patients with Cerebellar ataxias (CA)

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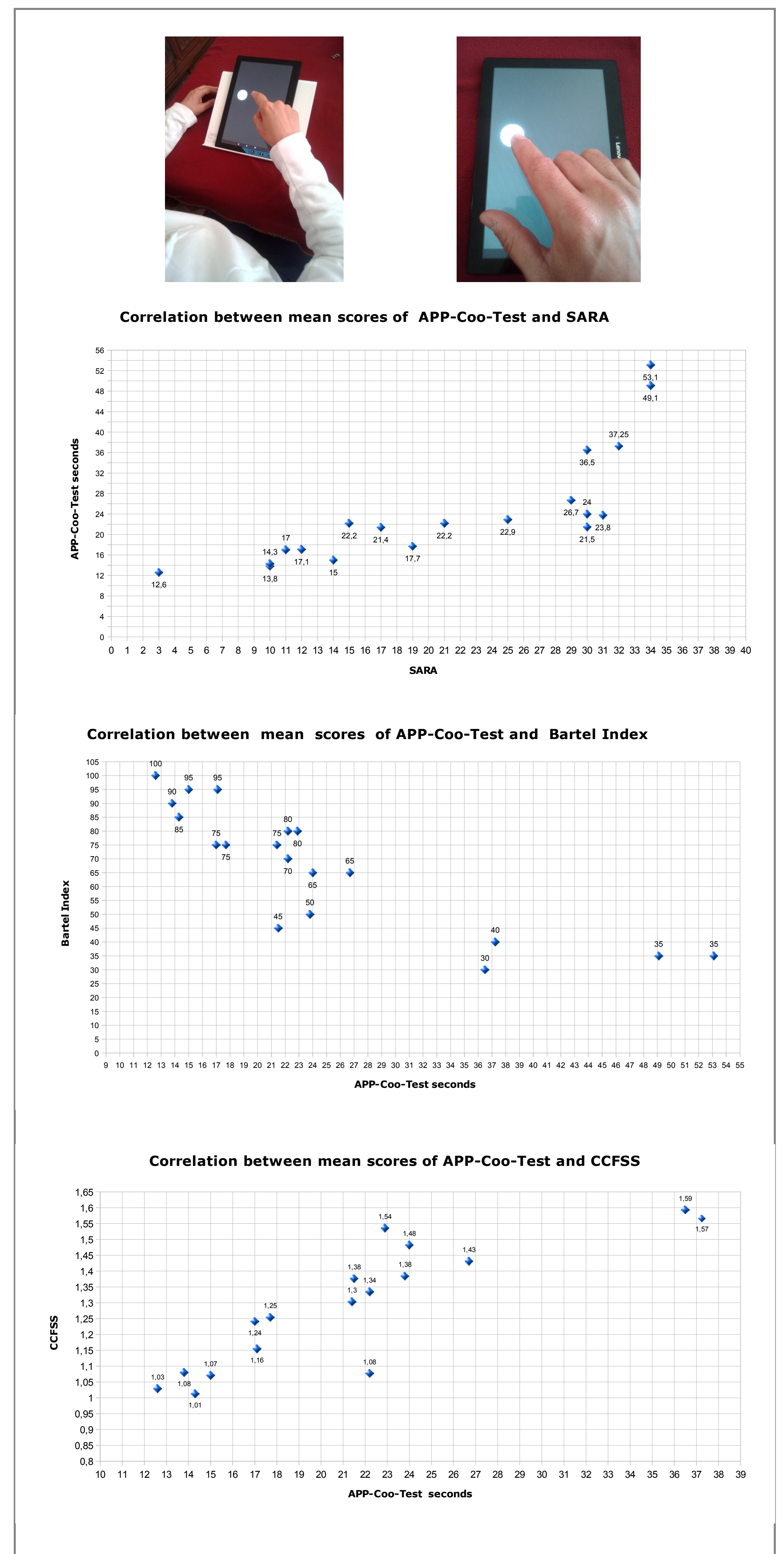
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Objective: Currently, the upper limb kinetics of patients with cerebellar ataxia (CA) is evaluated through points 5, 6 and 7 of the Scale for the Assessment and Rating of Ataxia (SARA)¹, points 1,2,3,4,5 of section B of Friedreich's Ataxia Assessment Scales (FARS)^{2/3/4}, and points 10,11,12,13 of the International Cooperative Ataxia Rating Scale (ICARS)^{5/6}. In the latter, at point 14, patients are also asked to reproduce the Archimedes spiral⁷. The latter is a qualitative measure, while SARA, FARS and ICARS are semiquantitative scales that yield only partially objective measurements^{8/9}. On the other hand objective assessment is needed to use them in clinical trials and quantitative evaluation systems, patients with CA. To this purpose the Nine Hole Peg Test (9HPT)^{10/11/12} and the Click Test (ClickT)^{13/14}, are currently used. Our study was aimed at developing a Touch Screen application, which we called A/uPPER Limb Coordination Test (APP-Coo-Test), in order to carry out quantitative measurements of the upper limb coordinative capabilities of ataxic patients in an easy, fast and repeatable way.

Materials and methods: 19 patients with genetically confirmed CAs have been studied: 12 with Friedreich's Ataxia (FRDA), 6 with Spinocerebellar Ataxia (3 SCA1, 2 SCA2, 1 SCA3) and one ARSACS, aged 25–58 years (mean age 40 ± 15.0 years, 8 males and 11 females, mean SARA score 21). All of them were evaluated with SARA, 9HPT, and Composite Cerebellar Functional Severity Score (CCFSS, combining Click Test and 9HPT) and the new APP-Coo-Test. To perform the APP-Coo-test, a tablet PC, sized 10.1 inches, was used. The patient was asked to touch with his index finger 15 white dots appearing consecutively on the screen at different positions, after having been correctly reached. The test was repeated with both dominant and non-dominant upper limbs. The relation between obtained APP-Coo-Test Values and SARA, Bartel Index and CCFSS, was assessed using Pearson's correlation coefficient. The minimum level of P-value was set at p<0.05.

Results: Measurements show a mean performing time of 1'27"7 for 9HPT, 35"6 for ClickT and 24"6 for APP-Coo-Test. Measurements with the APP-Coo-Test showed a strong correlation with the level of the disease as measured with SARA scale, $R^2=0,63$, $R=0,79$, $p<0,01$ (Graphic n°1), with CCFSS, $R^2=0,73$, $R=0,85$, $p<0,01$ (Graphic n°2), and with the level of autonomy as measured with Bartel Index, $R^2=0,72$, $R=-0,85$, $p<0,01$ (Graphic n° 3). The degree of correlation of the APP-Coo-Test was statistically significant. In addition severely affected patients with advanced disease, which were unable or almost unable to complete 9HPT, could be successfully evaluated.

Discussion: As compared with both Click Test and 9HPT, the App-Coo-Test proved to be faster and easier to perform. These features, combined with the repeatability of the test time, make it a valid and useful quantitative measurement method both to assess the progression of the disease, but also to detect any improvements as a result of clinical trials. Finally, it was also a feasible method for those patients with high disease levels who are often excluded from clinical trials because they are unable to perform the quantitative measurement tests currently in use.



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