

AMI. iFeel consists of a network of devices embedding inertial sensors for motion tracking and sensorized shoes for forces/torques acquisition.

Methods. A first subset of 5 PwMS followed as outpatients at AISM with Expanded Disability Status Scale (EDSS) ≤ 6.5 has been considered for a preliminary analysis. Participants (equipped with the iFeel) have been asked to perform the 30-seconds Figure of 8 Walk Test (F8WT) and the Timed-Up and Go Test (TUG). The following KPIs and biomechanics quantities have been computed: antero-posterior, medial-lateral and vertical components of the ground reaction forces; stance/swing phases as percentage of cycle duration; vertical forces normalized to bodyweight and to stance phase; stride length; swing width. In addition, iFeel software architecture allows for the online visualization of the whole-body kinematics, the center of mass and center of pressure. Furthermore, a preliminary inter-subject KPIs analysis on the correlation with EDSS has been performed for cadence, velocity, stride time and gait phases.

Conclusions. Preliminary outcomes configure iFeel as a promising tool for quantitative motor assessment in PwMS. To strengthen this analysis, a comparison with the state-of-art correlation between KPIs and EDSS has been performed. Preliminary results and trends are compatible with the literature references outcomes.

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Tapping to music and metronome ticks at high and low tempi in persons with progressive MS

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Background: Exploring the use of rhythmic patterns coupled to motor systems has been of great interest in rehabilitation of neurological patients, specifically for walking. Research has shown that participants with higher perceptual sensorimotor synchronization abilities, quantified by behavioural sensorimotor tapping tasks such as finger tapping, show better outcomes on walking parameters after walking to auditory stimuli. We investigated perceptual synchronization abilities and the impact of disability in Persons with Progressive MS (PwPMS) using a tapping task to beats in music and metronomes. Additionally, to examine adaptability and taking auditory central processing delays into account, tempi higher and lower than the preferred tapping speed were included.

Methods: Participants were asked to tap with the index finger of their dominant hand to music and metronomes at preferred comfortable speed (0%), -8%, -4%, +4% and +8%), while synchronization consistency (Resultant Vector Length (RVL), median Inter-Tap-Interval (ItI)) were measured. Additionally, the 9HPT and EDSS were correlated with RVL for music and metronomes.

Results: 19 PwPMS (median EDSS 4.4, 9HPT dominant hand 26.06s) and 16 healthy controls (HC's) were included. All participants synchronised consistently at all tempi, yet higher consistency was found when tapping to metronomes (RVL=0.94) compared to music (RVL=0.90) ($p<0.001$). This result is further reflected by the significant effect of tempi for median ItI ($p<0.001$), indicating that ItI was significantly shorter for high tempi compared to low.

Last, Spearman rank correlations showed a significant negative relationship between 9HPT performance and RVL for metronomes ($r=-0.40$, $p<0.001$) and between EDSS score and RVL for metronomes ($r=-0.37$, $p<0.001$) and music ($r=-0.40$, $p<0.001$).

Conclusion: The results show intact synchronization abilities of PwPMS, indicative that perceptual abilities are present and spared. This provides feasibility for using auditory-motor coupling during rehabilitation of PwPMS. However, synchronization abilities can be affected by disability score and upper limb skills.

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PREPARE: Personalized rehabilitation via novel AI patient stratification strategies

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Background: Rehabilitation is person-centered (based on prediction and stratification). Validated prediction models are lacking for many health conditions and outcome domains and developed with simple statistical tools, based on small data sets from single institutions, without external validation. They lack intelligent application programming interfaces (APIs) that allow them to be