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Introduction Chez les personnes qui ont subi un accident vasculaire cérébral (AVC), les déplacements faits dans la communauté peuvent représenter un défi, puisque ceux-ci nécessitent plusieurs prérequis, comme la capacité à gérer les obstacles et à diviser son attention entre la marche et la réalisation d'une tâche secondaire. Plusieurs études ont démontré la présence d'interférences lors d'une double tâche (DT), chez les personnes ayant subi un AVC. Ces études utilisent cependant des tâches peu représentatives de vie quotidienne, malgré l'influence connue de la nature de la tâche sur les performances locomotrices et cognitives. L'objectif est de mesurer l'interférence d'une DT lors de la réalisation de tâches locomotrices et cognitives représentatives de la vie quotidienne chez les personnes ayant subi un AVC.
Matériels et méthode Quinze personnes ayant subi un AVC devront se déplacer, à l'aide d'une plateforme omnidirectionnelle, dans un centre commercial virtuel (casque de réalité virtuelle) tout en mémorisant une liste d'épicerie. Deux niveaux de difficultés locomotrices et cognitives seront utilisés. Les interférences induites par la DT seront mesurées en comparant les performances locomotrices et cognitives lorsque les tâches sont effectuées séparément avec celles mesurées lors de la réalisation simultanée de ces tâches (test-*t* apparié). L'impact de la difficulté des tâches sera mesuré en comparant les interférences (ANOVA).
Résultats attendus La réalisation simultanée de tâches locomotrices et cognitives représentatives de la vie quotidienne aura un impact sur les performances locomotrices et cognitives des personnes ayant eu un AVC. La complexité des tâches influencera l'interférence.
Mots clés Locomotion ; Double tâche ; AVC

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Effect of upright standing postures on cortical oscillation spectral power modulations

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Introduction Amplitude modulation of cortical oscillations are associated to various movement parameters. Recently, theta-band cortical oscillations were shown to be involved in maintaining upright posture. However, the function of delta-, alpha-, beta-, and gamma-band cortical oscillatory components still needs to be clarified. To provide further understanding of the function of cortical oscillations in controlling balance, we investigated the effect of different upright standing postures on the modulation of cortical oscillations.
Materials and methods Brain activity and ground reaction forces of 13 participants were recorded using 64 electroencephalographic electrodes and a force platform. Participants stood upright in four conditions: with regular and narrow stance widths and on firm and foam surfaces. To obtain modulation of cortical oscillations, brain activity was also recorded while sitting on a chair. Modulation of cortical oscillation spectral power and the confidence ellipse area of the center of pressure displacement were compared between stance widths and surfaces using a linear mixed model.
Results Confidence ellipse area significantly increased during the narrow and the foam conditions. Delta-band synchronization significantly increased in the central region during foam and narrow conditions. In all conditions, alpha- and beta-band showed desynchronization in the central region. Additionally, alpha-band showed desynchronization in frontal and occipital regions, which was significantly greater during narrow stance conditions. Finally, gamma-band synchronization significantly increased in the right temporoparietal junction during narrow and foam conditions.
Discussion/conclusion Alpha- and beta-band desynchronization as well as delta- and gamma-band synchronization and their modulations during unstable postural conditions highlight the involvement of these cortical oscillatory components in balance control.
Keywords Balance; Electroencephalography; Task-related spectral power; Center-of-pressure

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Collision avoidance strategies in older adults

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Introduction In the younger adult (YA) population, collision avoidance has been found to be a collaborative process between two walkers. Further, the crossing order of two walkers, whether one crosses in front of or behind the other individual, is preserved during the interaction and impacts adaptive strategies used during locomotion. While these findings are consistent when analyzing YA, it is unknown whether these same anticipatory and adaptive strategies exist during collision avoidance in older adult (OA). The current study aims to identify whether differences in collision avoidance behaviours of OA during a person—person collision avoidance task are the result of age-related visuomotor processing deficits. It is hypothesized that OA will have delayed visuomotor processing leading to different adaptations.
Material and methods Eighteen OA (age 65—74) and eighteen YA (age 18—30) walk from one end to the opposite end of a 15 *15 m experimental area. During a single session, three YA and three OA participate in 141 walking trials resulting in YA/YA, YA/OA and OA/OA interactions. We analyzed participants' trajectories and computed number of crossing order inversions as well as clearance distance.
Results There were more crossing order inversion as well as smaller clearance distance in OA/OA interactions in comparison with YA/YA or YA/OA interactions.
Discussion/conclusion Although OA have similar and correct avoidance strategies as YA, their avoidance onset occurs later (i.e. closer to the other person), suggesting it is most likely due to delays in their visual processing, resulting in these different actions.
Keywords Person—person interaction; Collision avoidance; Human locomotion; Older adults behaviours; Perception—action integration

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Intersegmental body coordination during obstacle avoidance in a virtual environment

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Introduction Postural coordination is essential for implementing efficient obstacle circumvention strategies during locomotion. While virtual environments (VEs) are increasingly used to replicate real-life conditions and safely assess or train patients on complex locomotor tasks, the extent to which coordination strategies in VEs differ from that observed in the physical environment (PE) remains to be elucidated.
Material and methods The objective was to estimate the extent to which coordination strategies in the VE differ from the PE. Healthy young participants ($n = 10$) were assessed while walking towards a target and avoiding pedestrians approaching from different directions (left, centre, right) in a VE vs. PE. The VE, identical in size and appearance to the PE, was viewed using a HTC VIVE head-mounted display (HMD). Centre of mass trajectory (CoMt), as well as head, thorax and pelvis yaw, were measured using a Vicon system.
Results In both environments, participants reoriented their body segments towards their heading direction during obstacle circumvention. In the PE, the reorientation sequence started with the head (2.94 ± 0.04 m from obstacle), followed by the trunk (2.74 ± 0.03 m), pelvis (2.71 ± 0.04 m) and CoMt (2.64 ± 0.04). In the VE, reorientation started with the pelvis (2.97 ± 0.03 m) and trunk (2.95 ± 0.03 m), followed by the head (2.79 ± 0.04 m) and CoMt (2.77 ± 0.04 m). Smaller maximum head reorientation ($\Delta = 1.72 \pm 0.67$; $P < 0.05$) was observed in the VE vs. PE.
Conclusion Head reorientation was smaller and delayed in the VE, which could be due to the characteristics of HMD and a need for longer visual fixation on the obstacle/target. These differences should be considered when using VR in locomotor rehabilitation.
Keywords Virtual reality; Obstacle avoidance; Postural coordination; Pedestrian

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Gaze behavior of healthy young individuals navigating in a community environment

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Introduction Independent community walking relies heavily on the sense of vision and involves locomotor adaptations (i.e. changes in speed and direction) that are essential to avoid hazards in the environment (e.g. obstacles). In this project, we are examining gaze behavior and body kinematics as healthy individuals ambulate and avoid other pedestrians in a living lab representing a community environment. To characterize gaze behavior and kinematic strategies during obstacle circumvention while walking in a community environment.
Material and methods Twelve healthy young individuals (18—29 yrs) were assessed while walking towards a target with different exposures to static and moving obstacles in Alexis Nihon Mall in Montreal. Kinematics and temporal distance factors were assessed with wearable sensors (APDM) while gaze behavior was recorded with an eye-tracker (Tobii Pro 2).
Results Preliminary data analysis ($n = 3$) indicate that looming vs. receding pedestrians were looked at a closer distance and less frequently, for shorter duration but they yield higher relative gaze fixation duration. Also, right vs. left pedestrians were looked at a further distance.
Conclusion Results suggest that looming pedestrians, while present for shorter duration, impose a greater risk of collision. Results further suggest a possible lateralization of attention and maintenance of personal space during collision avoidance. Collectively, present findings will help better understand how visual information is used for obstacle negotiation in a community environment and will serve as a basis for comparison to understand community walking challenges experienced by older adults and individuals with a physical disability.
Keywords Gaze behavior; Kinematics; Living lab; Locomotion; Rehabilitation

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L'influence de la fonction vestibulaire sur le bénéfice postural lors d'une stimulation galvanique chez les personnes âgées

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Introduction Il est bien connu que la fonction vestibulaire se détériore avec l'âge. La stimulation vestibulaire galvanique (SVG) est une technique visant à améliorer la fonction vestibulaire par un courant électrique appliqué au niveau des mastoïdes. Elle a un effet bénéfique lors d'une tâche de contrôle de la posture chez les personnes âgées. Des études antérieures suggèrent que l'amélioration de la performance induite par une stimulation galvanique au niveau cortical est supérieure chez les sujets présentant une hypofonction. L'objectif de cette étude est d'examiner les effets de la SVG chez les personnes âgées ayant une fonction vestibulaire normale et de comparer leurs résultats à celles ayant une hypofonction vestibulaire.
Matériel et méthode Sept personnes âgées présentant une fonction vestibulaire normale et six ayant une hypofonction vestibulaire ont reçu aléatoirement une stimulation galvanique ou une stimulation placebo. Une tâche de contrôle postural statique sur un coussin en maintenant les yeux fermés a été réalisée pendant 30 secondes à deux reprises avant et durant la stimulation. Les paramètres de contrôle postural analysés étaient la vitesse de déplacement et le déplacement total du centre de pression (CoP).
Résultats Les données ont révélé une tendance démontrant une amélioration de la vitesse de déplacement et du déplacement total durant la SVG dans le groupe de personnes âgées présentant une hypofonction vestibulaire.