measured were motor skill competence (locomotor, manipulation, stability, balance), mostly from a process standpoint, and measured using 9 different instruments. Only 32% of the studies used a true experimental design. The dose of the interventions ranged from 120 to 7800 min (M = 3840) across 4 weeks to 1 year (M = 24 wks) with one study lasting 4 years but did not report weekly minutes. Motor development experts taught most (88%) of the interventions. In 28% of the studies, children demonstrated delays in motor skills. Intervention effect sizes were only reported in 9 studies and ranged from .11 to .97 (M = .43). All studies showed significant pretest-posttest improvements in motor skills with p values ranging from .05 to .0001. Only 3 studies provided statistical assumption data. Posttest gender differences were identified in 40% of the studies (n = 5). Few (16%) studies conducted follow-up tests after the intervention (9 weeks to 6 months). Future research needs true experimental designs and group randomized trials. Both process and product measure of motor competence needs to be assessed. Gender differences should be consistently examined across the intervention. Interventions need to more precisely describe dose and content, but also factors like practice trials, feedback and task constraints. Effect sizes need to be provided and broken out for different sub-groups of the participants (gender, ethnicity, skill level). Follow-up tests need to be performed and longitudinal tracking of children in such programs needs to occur to examine the extent to which early gains in motor competence are maintained across childhood.

Visuomotor control in continuous reaction time tasks across lifespan

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Controlling a computer mouse is a common task in human- computer interface. The skill of pointing and clicking the device greatly depends on users' visuomotor control capabilities. We examined whether simple visuomotor control and choice response performance with the computer mouse share similar, age-related, but not age-dependent developmental motor control trajectories. We are also interested in whether prior computer experience plays an important role in the control processes. Three groups of children (young, middle, old, aged 6-7, 8-9, 10-11 years), young adults (M = 24 years of age), and older adults (M = 76 years of age) performed the tapping and choice response time (CRT) tasks with a computer mouse. In the tapping task, children moved the mouse back and forth to click on two specific targets on the screen as fast as they could for 30 s. In the CRT, children moved and clicked one of the three targets placed horizontally on the screen based on visual, auditory stimuli, and both as fast as possible for 20 consecutive attempts. The results showed that visuomotor control improves from young childhood to young adulthood and deteriorates afterwards. CRT performance increases from young to middle childhood, and levels off till young adulthood. From young to older adulthood, performance is reduced to a level even lower than that of young children. Computer experience is only related to simple visuomotor control, but not to choice response time. The results suggest that optimal CRT performance only requires sub-optimal visuomotor control. Cognitive and sensory declines may underline an additional deterioration of choice response time performance in older age.

The effects of driving experience on postural activity and motion sickness in a virtual vehicle

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Experienced pilots are more susceptible than novices to motion sickness in flight simulator (cf. Johnson, 2004; Webb et al., 2009); however, the mechanism remains unclear. In the present study drivers and non-drivers (adults who did not have a driver's license) drove a virtual vehicle. We evaluated postural activity during virtual driving and motion sickness incidence. Twenty pairs of age and gender matched drivers (aged 24.08 ± 2.86 years) and non-drivers (aged 23.83 ± 2.83 years) participated. They sat on a stool 1.05 m away from a 140-cm LED monitor and played Forza Motosport, an X-Box 360 game, for up to 40 min. A magnetic tracking system (Flock of Birds, Ascension Technologies, Inc., Burlington, VT) were used to track the displacement of their head and torso movement at 60 Hz. A yes/no question and the simulator sickness questionnaire (SSQ) were used to indicate the incidence and the symptom severity of motion sickness, respectively. Thirteen drivers (65%) and 12 non-drivers (60%) reported motion sickness: These rates did not differ. A Mann-Whitney U test indicated that the sick group had higher post-exposure SSQ scores than the well group. A Wilcoxon signed ranks test indicated that the sick drivers, the well drivers, and the sick non-drivers had higher SSQ scores at post-exposure than at pre-exposure. We conducted two (Driving Experience: driver, non-driver) × 2 (Condition: sick, well) × 3 (Time: W1, W2, W3) mixed design 3 way ANOVAs on the positional variability of the head and torso. For torso movement in the ML axis the Driving Experience × Condition interaction was significant, F (1, 35) = 4.53, p = .040, η^2_p = .115. Post hoc analysis showed that the sick drivers exhibited smaller positional variability as compared to the well drivers while the sick non-drivers showed larger positional variability as compared to the well non-drivers. In conclusion, previous experience of driving a physical car affected postural control when individuals drove a virtual vehicle. The results will be discussed from the theory of postural instability.

Spontaneous paretic arm use after virtual reality-based stroke rehabilitation

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Spontaneous use of the affected arm in daily life was little studied in stroke population. With the neurorehabilitation, stroke survivors still encounter difficulty in incorporating their arms in daily and social activities, leading to a vicious cycle of the paretic

arm non-use. Recently, the virtual reality (VR)-based neurorehabilitation have been shown to effectively reduce impairments and disabilities through increased motivation and training intensity. However, little is known about the effectiveness of VR-based stroke rehabilitation system in improving spontaneous paretic arm use in real life. Therefore, this study was conducted for such purpose. Ten stroke survivors were recruited and received the upper extremity training in the virtual environment for one-hour per day by 12 sessions within 4 weeks. The VR-based exercise tasks included window wiping, ball shooting, ball catching, and airplane flying. These four tasks involved reaching/retrieving, grasping/releasing, and coordination movements. Motor Activity Log (MAL) was used to measure the spontaneous paretic arm use with the subscales of amount of use and quality of movement by the blinded rater. Paired *t* test was used to test the differences of both subscales before and after the VR-based stroke rehabilitation. After the VR-based stroke rehabilitation, significant improvement was found in the MAL quality of movement ($p = 0.01$). Although the MAL amount of use did not reach the significant level ($p = 0.06$), there was a tendency of increasing the paretic arm use after the VR-based training. Besides, people in the acute stage (stroke duration < 6 months, $n = 4$) were all increasing or at least maintaining their use of the paretic arm. Contrarily, only half of the people in the chronic stage ($n = 6$) increased the use of the paretic arm. Our results indicate that the VR-based upper extremity rehabilitation may be considered for the clinical practice in order to improve stroke survivors' spontaneous use of the affected arms in daily life, thus increasing the quality of life.

Cognitive and postural precursors of motion sickness in adolescent boxers

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Athletic head trauma (both concussive and sub-concussive) is common among adolescents. Concussion typically is followed by motion sickness-like symptoms, by changes in cognitive performance, and by changes in standing body sway. In adult boxers, pre-bout body sway differs between individuals who experience post-bout motion sickness and those who do not. We asked whether a similar effect would occur in adolescent boxers. In addition, we asked whether pre-bout cognitive performance would differ as a function of adolescent boxers' post-bout motion sickness. Adolescent boxers were recruited from a joint sparring competition involving three top ranked middle school boxing teams in Taiwan. For bouts, participants were randomly drawn and paired by their weight classification. Data were collected three times; before and after each boxer's 30-min warm-up, and immediately after their sparring bout (bouts lasted up to 6 min). In each data collection session, we measured standing body sway (the positional variability of the center of pressure) while participants stood on a force plate. In separate trials (each lasting 60 s) participants performed an Inspection task (maintaining their gaze within the boundaries of a blank white rectangle), or a Search task (counting the number of designated target letters that appeared in a block of text). Each task was performed once at each of three different stance widths (5 cm, 17 cm, or 30 cm). Mann-Whitney Tests were used for nonparametric subjective symptoms reports; ANOVAs were used to analyze data on standing body sway, with four factors: time (before warm-up, after warm-up, and after bout), stance width (3 levels), post-bout sickness status (Well versus Sick) and cognitive task (2 levels). We evaluated Search task performance in terms of the number of target letters counted. Nine of 19 boxers reported motion sickness after their bout. Search task performance was better among boxers who did not report post-bout motion sickness than among those who did.

Changes in the postural dynamics of sitting infants as they perform a concurrent task

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The ability to control posture based on the demands of a concurrent task is critical to the development of the major motor milestones (Claxton et al., 2012). Previous research has shown that newly standing infants increase sway complexity (as measured by Sample Entropy) when they are holding a toy compared to when they are not engaged in a task (Claxton et al., 2012). This increase in complexity may be an adaptive mechanism utilized by infants so that they can more efficiently fixate on and manipulate the toy. It is unclear whether the adaptive changes in sway complexity observed in newly standing infants are present at earlier key postural milestones such as sitting. Thus, in this current study, we examined the sway complexity of independently sitting infants while they were either sitting and holding a toy or not holding a toy. 21 infants (*M* age = 7 mos; 0 wks; Range = 6;1 to 8;3; 12 females) participated in this study. Infants could sit independently without risk of falling over (Stage 3; Harbourne & Stergiou, 2003), but were not yet hands-and-knees crawling. Infants performed two conditions while sitting on a force plate (AMTI): holding a toy and not holding a toy. Trials were intermixed and counterbalanced. Sample Entropy was calculated from the net CoP trajectory (collected at 120 Hz). A higher Sample Entropy was observed when infants held a toy ($M = 0.54$; $SE = 0.01$) as compared to when not holding a toy ($M = 0.50$; $SE = 0.02$); paired-samples *t*-test $t(20) = 2.04$, $p = 0.05$. These findings indicate that the ability to adapt postural sway when engaging in a concurrent task is not unique to the standing posture but is also present when infants begin to sit independently. Future longitudinal work is needed to determine whether adaptive posture in newly standing infants is a skill that is learned while sitting or is relearned once infants become capable of independent standing.

Perceived vs. actual competence in fundamental skill performance in pre-service physical education teachers

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The purpose of this study was to examine the relationship between perceived and actual competence in the performance of three fundamental motor skills in physical education majors. Eighteen preservice physical education teachers (mean age 20.17 years) enrolled in a motor development course participated in the study. Participants were informed that their kicking, striking and