Parasympathetic Activity and Mental Health in Chinese Adolescents: The Role of Parental Migration

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Background: Piles of literature reveal that parental migration is detrimental to the mental health of children and adolescents with negative consequences, such as depression, anxiety and conduct disorder. However, there are limited studies about how left-behind experience affects children’s physiological activity and its association with behavioral adjustment. Parasympathetic activity measured by respiratory sinus arrhythmia (RSA) is related to several self-regulatory processes, such as individual’s ability to emotion regulation and potential responsiveness to stress (Porges 1992). However, the relationship of RSA reactivity and externalizing and internalizing behaviors is controversial. Current study examined the role of parental migration in adolescents’ parasympathetic activity and how they interactively related to adolescents’ internalizing and externalizing behaviors.

Methods: Subjects were 149 adolescents (Mage=13.96, 74 boys) from rural and suburban China. RSA was assessed during the Trier Social Stress Test. Adolescents reported whether they had left-behind experiences due to parental migration, internalizing and externalizing behaviors.

Results: Results showed left-behind adolescents (LBA, n=92) and peers of non-migrant parents (N-LBA, n=57) only differ in speech RSA reactivity and N-LBA has blunted ones. Regression analysis revealed that controlling for age, gender and parents’ educational level, left-behind experience significantly moderated the relationship between resting RSA and externalizing behaviors, speech RSA reactivity and externalizing behaviors, math RSA reactivity and externalizing behaviors, respectively, but not internalizing behaviors. Specifically, resting RSA was negatively associated with externalizing behaviors in N-LBA (β=-0.43, p = .01) but unrelated in LBA (β=0.06, p = .65). Speech RSA reactivity was positively associated with externalizing behaviors in N-LBA (β=0.44, p = .01) but irrelevant in LBA (β=-0.01, p=.92). Math RSA reactivity was positively associated with externalizing behaviors in N-LBA (β=0.47, p=.02) but unrelated in LBA (β=0.00, p=.97). To explore the influence of different patterns of parental migration, we tested the same model with LBA divided into two groups: adolescents left by one parent (O-LBA, n=30), or both parents (B-LBA, n=62). The significant three parental migration patterns models were identical to two-pattern models. There was an interesting tendency in moderation role of left-behind experience between resting RSA and externalizing behaviors.

Conclusions: In conclusion, these findings suggest that parent-child separation in early life may negatively impact adolescents’ parasympathetic activity and its protective function against behavioral problems. Future research is needed to consider physiological activity in services to support the mental health of this specific population, especially for adolescents with two migrant parents.


Statistically Identifying and Removing the Spectral Differences Between EEG and MEG

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Background: In the resting state the EEG and MEG exhibit rhythmic brain activity typically in the alpha rhythm. Since these rhythms are generated by the same basic oscillations in the thalamocortical and cortical-cortical circuitry, they have quite similar topographic frequency spectral distribution for both modalities. However, there is a need of investigation to see if different physical aspects that underpin the two types of signals lead to a different distribution of reconstructed sources for EEG and MEG rhythms and whether these sources can be transformed from one to another? In this study, we address these issues by comparing eyes open EEG and MEG source spectra of 45 subjects each from the CHBM and HCP project.

Methods: Source spectra were obtained between 0-50Hz at 100 frequency points via a modern inverse method BC-VARETA and two well-known inverse methods eLORETA and LCMV. We performed a permutation-based t-test between source spectra of both modalities to see the differences. Later, we corrected source spectra for some
**Background:** Manual interception of moving objects is crucial for human and non-human primates to survive in the changing world. Whereas much attention has been paid to interaction with stationary objects, but little is known about the neural mechanisms underlying interceptive reach towards moving targets.

**Methods:** In this study, we recorded EEG signals from 10 right-handed human subjects while they performed a flexible manual interception task via a robotic arm. Each trial consisted of five epochs, repositioning, fixation, delay, movement, and break. After the fixation epoch, a green target appeared at outer ring, and stayed stationary within the upper half or moved from the bottom at a circular speed of 60°/s clockwise or counterclockwise. These three types of target motions were randomly interleaved trial by trial. Subject could intercept the target only when it was located within upper ring, i.e., during movement epoch. After the delay period, GO cue appeared, signaling that subject should intercept the target, as soon and accurate as possible. If successful, the target turned red as feedback. Involved brain regions were localized with ERP and sLORETA.

**Results:** The reaction time (RT) and movement time (MT) of reaches toward moving targets were 0.63±0.04 s and 0.33±0.05 s (Mean ±SD), respectively, significantly shorter than reaches toward stationary targets (RT = 0.71±0.07 s, p=0.01; MT = 0.42±0.14s, p=0.05, t-test), both with larger variance (p=0.05, one-tailed F-test), suggesting that subjects adopted different control strategies in reaches to moving and stationary targets. Compared with resting state, activation in multiple brain regions was significantly increased after GO in the moving-target trials (p<0.01, paired t-test). Increase in activation first emerged in superior parietal lobules, medial frontal and parietal areas, cingulate gyri, middle and superior frontal gyri, postcentral and precentral gyri in both hemispheres (350-450ms after GO), then in the superior parietal lobules, medial frontal and parietal areas, cingulate gyri, occipital lobes and parietal-occipital junctions in both hemispheres (450-500ms); lastly stayed in bilateral occipital cortices only (580-640ms). In contrast, for stationary-target trials, increased activation was mainly observed at medial frontal areas, cingulate cortices, and frontal poles in both hemispheres, left precentral and postcentral gyri and right middle frontal gyrus, and with significantly shorter duration (400-450ms), while decreased activity at left middle frontal gyrus and bilateral occipital lobes (p<0.05, paired t-test).

**Conclusions:** Compared to reach to static targets, more brain regions were recruited in interceptive reach for longer duration, indicating distinct control strategy and underlying brain networks in two tasks.


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**Features of Psychomotor Coordination in Adolescents With Neuropsychiatric Pathology Enrolled in a Standard Educational Program**

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**Background:** Psychosocial adaptation of young people with disabilities, in particular, through their inclusion in general education schools, is an important task of the modern educational environment. However, these children and adolescents can experience difficulties in performing various motor tasks during the educational process. Our aim was to study the features of psychomotor coordination in adolescents with neuropsychiatric pathology during performing unusual hand movements.

**Methods:** The study included students of a specialized school for patients of mental health clinics in remission (n=63), and mentally healthy adolescents from a general education school (n=70). The samples from both schools were divided into 2 age subgroups: 12-14 and 15-17 years.

Parameters of psychomotor coordination (speed, accuracy, and smoothness of movements and reaction time) were evaluated during performance of motor tests on a “computer motion meter” device that consisted in hand movement in the horizontal plane (from the elbow). The first test consisted in cyclic movement (right-left) of the cursor within the range marked by light markers with maximum possible speed and accuracy. During the test, the examinee has to change the amplitude and direction of movement in response to switching from external to internal markers and back to external, which corresponded to changes in the angular distance from 50° to 25° and back (change of the motor stereotype). These movements were unusual for children. During the second test, the latent periods of sensorimotor reactions to light and sound stimuli were measured.

**Results:** It was found that adolescents with neuropsychiatric pathology demonstrated better speed parameters (movement cycle duration, time to change movement amplitude) than healthy children. However, high speed of test performance was accompanied by lower movement accuracy (errors in sensory correction of different muscle groups during changing the movement amplitude) and smoothness of movements. This regularity was observed in both boys and girls in both age subgroups. In addition, age dynamics consisting in a decrease in the duration of the movement cycle with age typical of healthy children was absent in schoolchildren with neuropsychiatric disorders. No significant differences in the sensorimotor reactions, as well as by the indicators of motor asymmetry were revealed between the groups of adolescents.

**Conclusions:** Our study revealed some features of psychomotor coordination, in particular, imbalance between the speed and accuracy of movements in children and adolescents with neuropsychiatric disorders. The method used by us can be useful in evaluating the effectiveness of rehabilitation programs for schoolchildren with neuropsychiatric pathologies.


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**Pigeon’s Behavior is Goal-Driven in Spatial Navigation**

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**Background:** Rodents and birds are the two most commonly used animals for spatial cognition and navigation in the laboratory. The behavioral characteristics of rodents have been deeply understood in spatial navigation, but that of birds is rarely studied.

**Methods:** To uncover the behavior characteristics of birds, the pigeons were used as model animals to study it in free foraging task with or without goal by using small animal tracking system. To induce animals to move, food is thrown randomly in the task without goal, while one of the four food boxes is opened randomly in the task with goal. In this process, both the trajectories and the freezing time of pigeons were recorded. No matter whether the