**Childhood physical neglect promotes development of mild cognitive impairment
in old age-A case-control study**

Lan Wang^{a,b,c}, Linlin Yang^{a,b,c}, Lulu Yu^{a,b,c}, Mei Song^{a,b,c}, Xiaochuan Zhao^{a,b,c},
Yuanyuan Gao^{a,b,c}, Keyan Han^{a,b,c}, Cuixia An^{a,b,c}, Shunjiang Xu^c, Xueyi Wang^{a,b,c,#}

^aDepartment of Psychiatry, The First Hospital of Hebei Medical University

^bMental Health Institute of Hebei Medical University

^cBrain Ageing and Cognitive Neuroscience Laboratory

#Corresponding Author: Xueyi Wang, Department of Psychiatry, The First Hospital of Hebei Medical University, Brain Ageing and Cognitive Neuroscience Laboratory, Mental Health Institute of Hebei Medical University, 89 Donggang Road, Yuhua District, Shijiazhuang 050031, China; Tel: +86031185917113; Fax: +86031185917115; email: ydyywxy@163.com

Running head: Childhood trauma promotes MCI

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Abstract

This study aimed to investigate the role of early traumatic experiences in development of mild cognitive impairment (MCI) in elderly people. 76 patients and 61 controls were selected and assigned into two study groups, MCI and control, respectively. Childhood Trauma Questionnaire-Short Form (CTQ-SF) was used for assessment of early trauma, episodic memory and association learning scales for memory evaluation. In addition, event-related potentials (ERPs) were measured using electroencephalography (EEG) to indicate brain electrical activity of subjects during memory/cognitive tests. MCI patients showed higher scores of physical neglect and lower scores of emotional abuse in childhood than control group. Physical neglect score was negatively correlated with scores of MMSE, MoCA, episodic memory, calculation, and the amplitude of CzP300, FzP300 and PzP300, while a positive correlation was seen between the score of physical neglect and the latency of PzN200, FzN200, CzN200, CzP300, FzP300 and PzP300. The score of emotional abuse was weakly correlated with FzP300 amplitude, but not with any other ERP components. Our results suggested that early childhood exposure to physical neglect may lead to impairment in learning and memory, particularly in the associative learning and episodic memory, in old age.

Key words: elderly; mild cognitive impairment; early childhood trauma; learning and memory; event-related potentials

1. Introduction

Dementia is an irreversible disease that affects intellectual functions including memory and cognitive capability. Currently, mild cognitive impairment (MCI) is recognized as a transitional state between normal aging and dementia(Petersen et al., 2001). However, epidemiological studies showed that 15% MCI patients developed dementia, (Petersen et al., 2001), which is significantly higher than in the normal elderly population (between 1% to 2%)(Petersen et al., 1997). Therefore, a fully understanding of the factors linked to the development of MCI will provide clues leading to identification of individuals at a high risk of developing dementia.

Traumatic events are referred to extraordinary threatening and catastrophic events such as natural and humanities disasters including war and serious accidents. Previous studies have shown the association between the occurrence of senile dementia and early traumatic events (Charles et al., 2006). For instance, about 70% of patients with dementia experienced at least one serious early traumatic event (Tsolaki et al., 2010). Studies in animals and clinically also suggest that early experiences of stress can lead to structural and functional changes in the brain, primarily in the frontal lobe, temporal lobe and hippocampus, consequently impairing cognitive function(Lupien et al., 2009). Majer et al studied a group of healthy adults that had experienced early trauma and concluded that there was a link between early physical neglect and emotional abuse and long-term working memory deficits in adulthood(Majer et al., 2010). However, another two studies on the children and young people with and without experiencing early trauma found no obvious relationship between learning and memory defects and early trauma(Saigh et al., 2006; Yasik et al., 2007). At

present, it remains controversial regarding the long-term impact of early trauma on cognitive function, and the studies on the role of early childhood trauma in the development of the cognitive deficits with aging are limited.

Event-related potentials (ERPs), recorded as EEG, are voltage changes that reflect the links of the electrical activity in the brain to some physical or mental activities. ERPs are believed to be a useful, objective, accurate and psychophysiological indicator for assessing changes in cognitive functions including the attention processes, language, and memory functions. P300 is a component of ERP and is elicited at 300 (between 200-700) ms after stimulation, and is considered as an endogenous potential. The change in P300 is significantly linked to the psychological factors such as intention and decision-making but not to stimulation parameters, therefore reflecting the multi-level mental activities such as memory, perception, understanding, judgement and emotion. N200 is the waveform around 200ms with negative deflection, and reflects cognitive processes such as selective attention and awareness resolution. Specifically, the P300 has been widely used in the brain research of dementia-related cognitive dysfunction because it reflects attentional and memory processes. For instance, a previously study (Bennys et al., 2007) reported that N200 and P300 latencies were significantly prolonged in Alzheimer's disease (AD) patients compared to either MCI patients or controls. Another study suggested that P300 latency increased with natural aging (Golob et al., 2007), and was significantly prolonged in MCI patients compared with controls (Golob et al., 2007; Papaliagkas et al., 2008). In addition, P300 latency was found to have a positive correlation with child abuse such as physical and sexual abuses in a cohort of healthy population (Howells, et al., 2012). However, little is known about the relationship

between ERP and early childhood trauma in MCI.

We hypothesized that childhood trauma could cause electrophysiological changes in brain function, and these changes may last to the old age, resulting in cognitive decline.

Herein we used neurocognitive psychology and event-related potentials (ERPs) to assess the contribution of early traumatic events to the cognitive impairment in old age. Our findings provided evidence for the role of childhood trauma in development of mild cognitive impairment (MCI) in the elderly population.

2. Subjects and Methods

2.1 Subjects

The controls and patients were selected from a population pool obtained from a previous MCI survey performed on 1605 people with age over 60 at Shijiazhuang City Community from December 2009 to December 2010(An et al., 2012). In total, there were 342 patients and 1263 control elderly people. On a voluntary basis, 76 people with MCI and 61 control subjects were finally selected for this study.

MCI selection

Inclusion criteria: (1) *The diagnosis of MCI was based on the diagnostic criteria proposed by Petersen et al. (Petersen et al., 1999) (table 1)*: i) *memory complaint*; ii) *Activities of Daily Living scale score <26 (20 items)*; iii) *normal general cognitive functions*; A: *MMSE score between 20 and 27 (cutoff points for illiterate ≤ 21 , primary school ≤ 22 and secondary school and above ≤ 27)*; B: *MoCA score <26*; iv) *subjects having a score 1.5 SD below the cutoff were diagnosed as MCI if with 0~0.5 score of the Clinical Dementia Rating scale*; v)

no dementia; clinical diagnosis of dementia was based on the DSM-IV criteria. (2) age ≥ 60 ; (3) able to cooperate to complete the cognitive function tests. Exclusion criteria: (1) those who were unable to cooperate to complete the cognitive function tests due to aphasia, deafness, blindness or other physical illness and those who were colorblind; (2) those who had neurological disorders such as stroke and Parkinson's disease which may negatively affect cognitive function; (3) those who had major depressive disorder, schizophrenia, bipolar disorder, post-traumatic stress disorder that may negatively affect the assessment of cognitive function, which were evaluated by a professional psychiatric physician with *STRUCTURED CLINICAL INTERVIEW FOR DSM-IV-TR AXIS I DISORDERS (RESEARCH VERSION)*; (4) those who had physical diseases that severely affect sleep.

Control group

Inclusion criteria: i) age ≥ 60 ; ii) no cognitive impairment complaint; iii) according to educational stratification, Mini-Mental State Examination (MMSE) score was higher than the demarcation points; Montreal Cognitive Assessment Scale (MoCA) score ≥ 26 points; Activity of Daily Living Scale (ADL) < 26 points; the Clinical Dementia Rating Scale (CDR) = 0 points; iiiii) able to cooperate to complete cognitive function tests. Exclusion criteria: same as those for MCI group.

All individuals that participated in the study were informed of the study and signed informed consent. This study was approved by the First Hospital of Hebei Medical University Ethics Committee.

2.2 Methods

All scales were evaluated by trained psychiatrists, who passed consistency test after training.

Kappa = 0.83.

2.3 Montreal Cognitive Assessment (MoCA)

The test includes visuospatial ability to execute, memory, verbal fluency and abstract thinking, with a total score of 30 points. The persons who had received less than 12 years of education obtained additional 1 point to correct the bias of educational level. A higher score defines a better cognitive function. Demarcation score is 26 point, and the persons whose score was less than 26 points were considered cognitive decline(Nasreddine et al., 2005);

2.4 Mini-Mental State Examination (MMSE)

This test is a common test for screening Alzheimer, and includes orientation, memory, attention and other cognitive domains, with a total score of 30 points. MMSE is used to differentiate between normal aging and dementia with sensitivity and specificity of 80% and 90%, respectively, and is suitable for patients with moderate to severe dementia. In this test, the determination of cognitive impairment of a person is related to his/her education level as follows: with an education level above high school, a person with a score less than 27 was considered as having cognitive impairment; with an elementary school education, a person with a score < 24 points was defined as having cognitive impairment; if being illiterate, a person with a score < 21 points was taken as having cognitive impairment(Petersen, 2004). The MCI patients were defined as having both MoCA < 26 and MMSE being lower than the respective demarcation point linked to the corresponding education level.

2.5 Childhood Trauma Questionnaire - Brief Version (CTQ-RF)

CTQ-RF was used to assess early trauma of the subjects. CTQ-RF has 28 items in total, including 25 clinical items and 3 validity items, with each entry starting with "I grew up". CTQ-RF uses five levels of scoring to retrospectively assess childhood experiences. For instance, the 20th question, "somebody attempted to touch me or let me touch him," according to the frequency of occurrence, the answer may be: 1 point: never; 2 points: occasionally; 3 points: sometimes; 4 points: regular; 5 points: always. Each subscale is between 5 to 25 points, with a total score between 25 to 125 points. In the present study, the total subscale score was the sum of the score of each item within that respective subscale, and the total scale score was the sum of the score of each subscale(Fu et al., 2005).

2.6 Scale of episodic memory and associative learning

The Wechsler Memory Scale was used to determine episodic memory and associative learning of the subjects.

Episodic memory test: Two stories (A & B) were read to the subjects. After reading, the subjects were requested to repeat the contents of A & B. Correctly repeating one content scored 0.5 point and the sum of scores for A & B were recorded. The total point is 17.

Associative learning test: There were 12 pairs of phrases with each phrase consisting of two words. 6 pairs of phrases were easy for associative learning (i.e. the relationship among the phrases used were associative), and 6 pairs of phrases were difficult (i.e. no logical relationship existing among these phrases); these phrases were used to test the ability to learn and memorize. Every phrase was spelled out at a speed of 3s, and the time difference between the readout of two paired phrases was 2s. 12 paired phrases were randomly arranged, and three times of readout of one paired phrase meant three chances of learning.

Every time the first word of each phrase was spelled out (i.e. clue word), the subject was asked to give the second word (reaction word). A score of 0.5 point was given if the correct answer was an easy word with a total of 3 points, while a score of 1 point was given if the correct answer was a difficult word with a total of 6 points. The total score was the sum of the point from each test, with a maximum of 27 points.

2.7 Adulthood Life Events Questionnaire

In combination with our country's circumstances, this questionnaire included the following items: (1) loss of a spouse; (2) loss of parents and children; (3) economic difficulties; (4) divorce; (5) unemployment or layoff; (6) accidents (traffic accidents, fires, flooding, earthquake and other natural disasters); (7) incidences related to the crimes such as being robbed and kidnapped or property stolen; (8) others. Then the stress events were calculated.

2.8 ERPs detection

The ERP instrument (Neuroscan. Amplifier type: SynAmps2) was used to detect ERP according to the manufacturer's user manual. Briefly, EEG acquisition gain was set to 500, A/D sampling frequency 500 Hz, the band-pass filter 0.05-40Hz. Resistance between each electrode and the scalp was less than 5 K Ω . Scan4.5 software was used to analyze EEG, and offline data analysis was performed to assess the changes in latency and amplitude of N200 and P300.

Binaural auditory oddball paradigm was used in ERPs. Stimulation materials were randomly arranged using two pure tones (pitch 70Db, stimulation time 100ms): the high-frequency pure tone (frequency of 2K Hz) for the target stimulation, and the low-frequency one (frequency 1K Hz) for non-target stimulation. The target stimulus appeared ~50 times (20%),

while the non-target stimulus appeared ~200 times (80%) (Different subjects might have a slight difference). The length of the interstimulus interval (ISI) was 1500ms. Experimental subjects were requested to identify and memorize the number of target stimulus that had been presented. At the end of each test, the subjects' ability to cooperate and count was reviewed and confirmed. Completion of this experiment required a total of about 7 min. ERP testing was performed between 8:00 am to 11:00 am in a soundproof room. All subjects were sitting on a chair in a relaxing state with little movement and clear mind and focus. Prior to the test, all subjects were given a pure tone hearing test to ensure that all participants had normal hearing, and were explained about the experimental requirements and precautions. The whole process had fixed operators, who used unified operation and instruction language.

2.9 Quality Control

All the investigators were either psychiatrists or graduate students, and had been trained based on uniform and standardized questionnaire survey language, to ensure the consistency of the findings and to reduce bias. To further maintain quality control, before the official examination had started, every investigator was provided five patients for pre-examination and then discussed the problems encountered and the methods used to handle them. After testing, the consistency of all the investigators was greater than 95%. The patients with memory impairment were accompanied by their family members who also answered some questions to reduce the retrospective bias.

2.10 Data collection and statistical analysis

Scientific coding was used for the original data. An independent third-party was established in the Institute of Chinese Traditional and Clinical Basic Medical Sciences at Chinese Traditional Medicine Academy of China. All data entries were carried out by the professionals using double entry mode to ensure entry correctness. SAS 9.2 software was used for statistical analysis. Chi-square test was used for comparison of categorical variable between two groups. Statistical differences of continuous variables between two groups were determined by independent two-sample *t*-test if data was normal distribution; otherwise Wilcoxon rank sum test was used. Correlation intensity of childhood trauma and MCI were estimated using Spearman correlation analysis. Multivariate stepwise logistic regression was performed to further analyze the association between childhood trauma and MCI by adjusting factors such as age and adult stress event. $p < 0.05$ was considered statistically significant.

3. Results

3.1 Comparison of general demographic data between MCI and control group

Summary statistics of gender, age, education level, occupation, adult stress events, diabetes and cardiovascular disease of included samples were showed in **Table 1**, and no significant difference was observed in terms of gender, education level, occupation and diabetes between MCI and control group ($p > 0.05$).

3.2 Childhood trauma scores between MCI patients and control group

Five sub-items of childhood trauma such as emotional neglect, emotional abuse, sexual abuse, physical neglect and physical abuse of patients and controls were investigated, and

each sub-score and total scores (CTQ) were calculated. As shown in **Table 2**, there was a significant difference in subscores of emotional abuse and physical neglect between MCI and control group ($p < 0.05$). When five subjects with CES-D scores >10 were excluded in this analysis, the statistical significance were still seen. MCI showed a higher score of physical neglect and a lower score of emotional abuse than control group, but no difference was observed between these two groups in the subscores of emotional neglect, sexual abuse sub-items scores and the total score of CTQ ($p > 0.05$). Comparisons of MMSE, MoCA, Mood and sleep between two groups were shown as **Supplementary Table 1**. Significant differences were found of ADL, CES-D, gds, Associative learning, MMSE, MoCA, PQSI and Episodic memory.

Next, cognitive function of the subjects was determined in the present study using Montreal Cognitive Assessment, Mini-Mental State Examination, Wechsler Memory Scale, and analysis of intensity correlation between childhood trauma and MCI was performed according to cognitive function test scores and scores of CTQ. As shown in **Table 3**, physical neglect score was negatively correlated with the scores of MMSE, MoCA, episodic memory and calculation (Spearman's $r = -0.24, -0.25, -0.26, -0.27$ respectively; $p = 0.01, 0.00, 0.00$, respectively). On the contrary, no statistically significant correlation was seen between the score of emotional abuse and each score of cognitive function tests in this study. ERPs, as an objective and quantitative index for estimating cognitive function, were measured using EEG in the present study. As shown in **Table 4**, the physical neglect score was positively correlated with PzN200 latency, FzN200 latency, CzN200 latency, CzP300 latency, FzP300 latency and PzP300 latency (Spearman's $r = 0.26, 0.30, 0.36, 0.24, 0.38$,

0.33 respectively; $p = 0.00, 0.00, 0.00, 0.00, 0.00, 0.00$ respectively), but negatively correlated with CzP300 amplitude, FzP300 amplitude and PzP300 amplitude (Spearman's $r = -0.25, -0.26, -0.24$ respectively; $p = 0.00, 0.00, 0.01$, respectively). Emotional abuse exhibited a weak negative correlation with FzP300 amplitude, but showed no any significant correlation with other index of ERPs. Comparisons of ERP data between two groups was illustrated in **Figure 1**.

3.3 Risk assessment of MCI for trauma exposure in childhood

Multivariate stepwise logistic regression was performed to assess potential risk factors of MCI. The variables in Table 1 and childhood trauma exposure scores were defined as independent variables when the logistic regression model was used for assessment. As shown in **Table 5**, adult stress events, age, diabetes, emotional abuse and physical neglect were retained in the model finally. People with a higher score of physical neglect in childhood were at a higher risk of MCI in old age, (OR=1.232, 95%CI: 1.073-1.414) with age, adult stress events, diabetes, emotional abuse adjusted. when five subjects with CES-D scores >10 were excluded in this analysis, statistical significance still existed.

4. Discussion

We previously reported that (An et al., 2012; Song et al., 2014) aging, low education level, spouse's death and sleep disorders were high-risk factors for MCI incidence. Consistent with that, in the present study, we compared control and MCI groups based on age, education level, marital status, occupation, major life events in adulthood and sleep, etc., and observed that age, adult stress events and cardiovascular diseases were indeed correlated

with MCI. In addition, we also investigated the impact of early traumatic events on the incidence of MCI in the old population. The results showed that the associative learning and episodic memory performance in MCI group was significantly worse than that in control group as expected. We also found that the early experience of traumatic events, especially physical neglect, played an important role in MCI development. Correlation analysis showed that physical neglect was reversely correlated with MMSE, MOCA, episodic memory, i.e. the higher score the physical neglect obtained, the worse the cognitive function was in the elderly, particularly in the aspects of learning and memory. These findings are in line with those previous studies, which showed that emotional abuse, emotional neglect and physical neglect were positively correlated with the total scores obtained from using the frontal system behavior scale (Frontal Systems Behavior Scale, FrSBe), while sexual abuse, emotional neglect and physical neglect were negatively related with IQ (Pluck et al., 2011). In addition, Syal et al reported (Syal et al., 2014) that the early childhood trauma, but not the adulthood trauma, could damage adulthood visuospatial memory, especially in women. However, our study found no differences between the sexes. This discrepancy is probably attributed to the difference in the sample selections in these two studies. A recent study (Burri et al., 2013) compared the effects of childhood trauma and adulthood trauma on the cognitive function in the elderly, and concluded that childhood trauma and post-traumatic stress disorder (PTSD) were associated with cognitive performance, and that PTSD were positively correlated with the decline in cognitive activity. Mechanistically, animal studies have demonstrated that early stress induced the release of glucocorticoids, and if the stress persisted for a long time, the release of cortisol increased and consequently

caused the atrophy of hippocampus, which is the major domain in the brain that is linked to learning and memory. Thus, a persistent stress will eventually increase the incidence of aging-associated cognitive impairment(Solas et al., 2010). This may also be one of the mechanisms underlying the long-term impact of early trauma on cognitive function.

P300, a component of ERP, is the waveform of around 300 ms deflected to the positive waveform. P300 is now recognized as an objective indicator in determination of selective attention, memory and other cognitive activity(Vitay and Hamker, 2010). While the latency of P300 reflects the velocity of the brain's classifying, encoding, and recognizing the external stimuli, the amplitude reflects the extent to which the resources in brain are participating in the information processing(Papaliagkas et al., 2011). Numerous studies have demonstrated that P300 can be used as a neuroelectrophysiological index for the early diagnosis of AD and MCI patients (Papaliagkas et al., 2011). Similarly, another component of ERP, N200, is the waveform of around 200 ms deflective to the negative and can reflect the cognitive process such as selective attention and awareness resolution. A previous study showed that the N200 amplitude and P300 latency were more effective indicators for the early identification of MCI(Papaliagkas et al., 2011). Consistent with the above findings, our study demonstrated that physical neglect was positively correlated with the latencies of both P300 and N200, but negatively correlated with their amplitudes, suggestive of that the higher score obtained from evaluation of early trauma, particularly physical neglect, represented the slower velocity of the information processing in the brain, as well as the smaller effective resources that were mobilized. The clinical manifestations resulting from

these electrophysiological abnormalities are the slow response and memory decline (Kutas et al., 1977; Li, 2011; Zheng et al., 2012).

In conclusion, our study demonstrates that the early trauma, i.e. physical neglect, plays a major role in decrease in the learning and memorizing capability, particularly in the impairment of the episodic memory in the people with aging. However, there are some limitations for this study. For instance, this research is a cross-sectional survey study, in which the elderly recalled what had happened to them when they were in childhood. Their self-descriptions might have some errors or biases. Also, the age difference between the two groups may bring the bias to the results to some degree. In addition, our study has a small sample size, and did not take into consideration the potential effects of prescriptions some patients had been taking due to physical illness on cognitive function. Thus, a study with a large sample size is needed to reproduce/corroborate our findings in the future.

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Figure legend

Figure 1. Comparison of ERP data between two groups.

Table 1. General demographic data of MCI and control group

Variables	Control, n=61	MCI, n=76	<i>p</i>
Gender (%)			0.656
male	28 (45.90)	32 (42.11)	
female	33 (54.10)	44 (57.89)	
Cardiovascular disease (%)			0.023
Yes	11 (18.03)	27 (35.53)	
No	50 (81.97)	49 (64.47)	
Diabetes (%)			0.060
Yes	9 (14.75)	4 (5.26)	
No	52 (85.25)	72 (94.74)	
Education level (%)			0.324
Illiteracy	12 (19.67)	15 (19.74)	
Elementary school	18 (29.51)	24 (31.58)	
Junior high school	13 (21.31)	16 (21.05)	
Senior high school	13 (21.31)	8 (10.53)	
College and over	5 (8.20)	13 (17.11)	
Occupation (%)			0.367
Services	13 (21.31)	8 (10.53)	
Workers	14 (22.95)	22 (28.95)	
Professionals and technical person	15 (24.59)	15 (19.74)	
Unemployed	8 (13.11)	14 (18.42)	
Other	11 (18.03)	17 (22.37)	
Adult stress events (%)			0.041
0	15 (24.59)	34 (44.74)	
1-2	24 (39.34)	19 (25.00)	
3-4	12 (19.67)	17 (22.37)	
5-6	10 (16.39)	6 (7.89)	
Age, mean $\pm$ sd.(year)	70.48 $\pm$ 5.05	73.26 $\pm$ 5.59	0.003

Table 2. Comparison of childhood trauma scores between MCI patients and control groups

Trauma subgroup	Control, n=61	MCI, n=76	<i>p</i>	<i>P*</i>
Emotional neglect	6.34±2.67	6.96±3.16	0.289	0.385
Emotional abuse	5.80±1.79	5.42±1.26	0.028	0.037
Sexual abuse	5.07±0.51	5.00±0.00	0.271	0.280
Physical neglect	7.61±3.19	9.04±3.63	0.014	0.019
Physical abuse	5.28±0.93	5.42±1.86	0.380	0.424
CTQ score	30.10±7.40	31.84±7.55	0.054	0.066

*Five subjects with CES-D scores >10 were excluded considering the fact that greater depression may be more likely associated with tendency to retrospectively recall greater abuse in childhood .

Table 3. Analysis of correlation between emotional abuse/emotional neglect and mental state, episodic memory and associative learning

Variables	Emotional abuse		Physical neglect	
	r^*	p	r^*	p
MMSE	0.05	0.55	-0.24	0.01
MoCA	0.07	0.39	-0.25	0.00
ADL	-0.13	0.12	0.05	0.57
PQSI	-0.14	0.11	0.04	0.62
CES-D	-0.11	0.19	0.08	0.33
Associative learning score	0.16	0.07	-0.09	0.28
Episodic memory score	0.10	0.27	-0.26	0.00
Calculation	0.12	0.15	-0.27	0.00

*Spearman's r

Table 4. Correlation analysis between emotional abuse/physical neglect and ERP data

ERPs	Emotional abuse		Physical neglect	
	r^*	p	r^*	p
PzN200 latency	-0.09	0.28	0.26	0.00
PzN200 amplitude	-0.14	0.10	-0.09	0.28
FzN200 latency	0.01	0.89	0.30	0.00
FzN200 amplitude	-0.06	0.47	-0.05	0.59
CzN200 latency	0.04	0.66	0.36	0.00
CzN200 amplitude	-0.12	0.16	0.09	0.30
CzP300 latency	0.02	0.80	0.24	0.00
CzP300 amplitude	-0.09	0.29	-0.25	0.00
FzP300 latency	0.07	0.44	0.38	0.00
FzP300 amplitude	-0.18	0.04	-0.26	0.00
PzP300 latency	0.02	0.84	0.33	0.00
PzP300 amplitude	-0.06	0.47	-0.24	0.01

*Spearman's r

Table 5. Risk Factors assessment of MCI

Variables	OR*	95% <i>CI</i>		<i>p</i>	<i>P**</i>
		Lower	Upper		
Adult stress events					
5-6 vs. 0	0.182	0.050	0.663	0.037	0.0288
3-4 vs. 0	0.728	0.254	2.086	0.227	0.242
1-2 vs. 0	0.363	0.137	0.960	0.442	0.439
Age	1.109	1.027	1.199	0.008	0.004
Diabetes					
No vs. Yes	4.761	1.174	19.301	0.029	0.033
Emotional abuse	0.658	0.485	0.894	0.008	0.012
Physical neglect	1.232	1.073	1.414	0.003	0.007

* Stepwise logistic regression, **Five subjects with CES-D scores >10 were excluded considering greater depression may be more likely to retrospectively recall greater abuse in childhood .