850 nm) and ten photo detectors. Figure 1 shows the CH locations on the fNIRS probe. Hemodynamic changes were calculated using the modified Beer–Lambert law [14]. The sampling frequency was 2Hz. First, the raw fNIRS intensity measurements were low-pass filtered with a cut-off set to 0.14 Hz [15] to remove noises derived from movement artifacts, heart pulsation and respiration. Then data of each channel were averaged across 32 target responses for each subject. Target responses identified 3 s before the target stimuli period onset to 10 s after the target stimuli. Grand average of oxy-Hb responses of one male and one female showed in Figure 2.

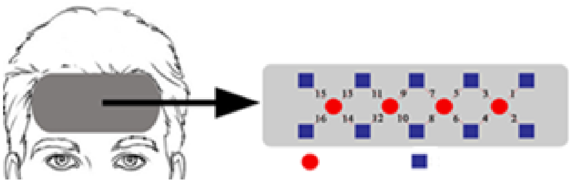
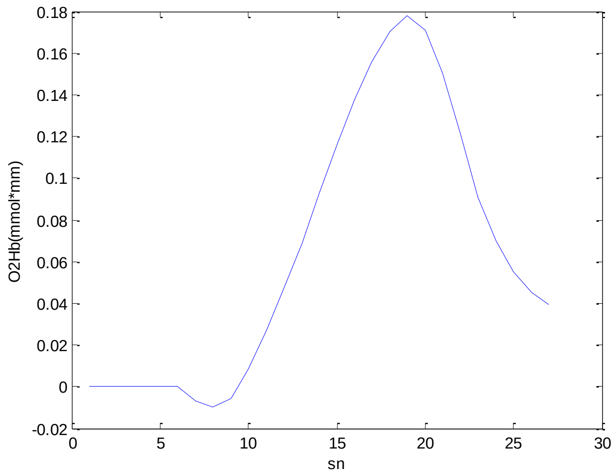


Figure 1. The source-detector locations on the fNIR probe.

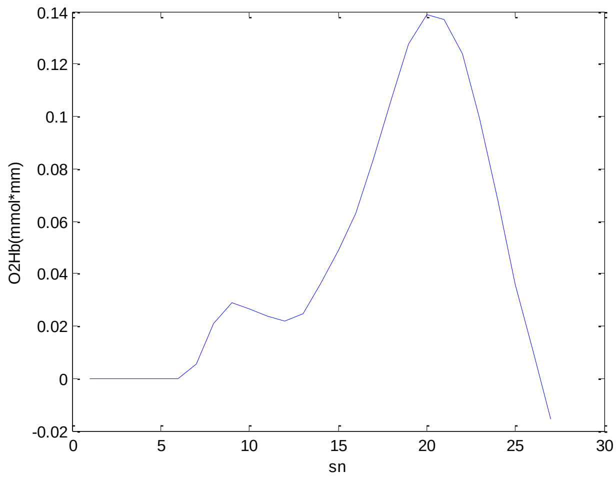
D. fNIRS Data Analysis

In this study because of its high sensitivity and reliability, we focused on the oxy-Hb signal [16]. The average of the integral value of oxy-Hb was calculated for covered all channels in PFC (CH 1 to CH 16).

Grand average of each CHs for 12-male and 9-female group calculated. For statistical analysis, among the groups we performed Mann Whitney U test because there were two independent groups and the data were not normally distributed. In each channel we assessed the integral value of oxy-hbo signal.



(a)



(b)

Figure 2. Grand average of oxy-Hb target responses of a male (a) and female (b) subject.

	Male	**Female**	**p**
Int- oxy-hbo	1,838 ± 0,54	1,219 ± 0,25	0,023

Table I. Mean, standard deviation and statistical analysis of integrated oxy-Hb for each ROI.

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III. RESULTS

We assessed the group difference in integral value of oxy-Hb signals with Mann Whitney U test. Table 1 shows concentration change of integral values of oxy-hbo among with group statistics. Descriptive values obtained by data analysis were expressed as means±S.D. (standard deviation). Differences were considered to be statistically significant if they had a probability of less than 0.05 ($p<0.05$).

IV. DISCUSSION

This study was designed to determine effects of gender on brain oxygenation patterns during auditory oddball paradigm. We found that males exhibited higher prefrontal activation during auditory oddball task than females in prefrontal cortex. So gender influenced performance on auditory oddball task. The reasons for this finding may be attributed to functional or structural differences in brain for both groups. Also researchs have demonstrated that sex hormones were implicated in general cognitive status, specifically in executive functions [17].

In literature, a range of cognitive tasks evaluated for investigating gender influences on prefrontal cortex oxygenation levels. While some of these studies showed females' oxy-hbo levels were higher than males' some other studies illustrated males' oxy-hbo levels were higher than females. It was depending on cognitive task. For instance, females showed better performance in emotional tasks [2], while males show better performance in maze tasks [11]. We selected an easy, short task contains standard and target paradigm with random sequence that can be appropriate for children. The test is related to attention so appropriate for assessment of prefrontal cortex.

Because of the increased number of children with psychosomatic, behavioral, and psychiatric disorders visiting outpatient clinics, in this study we choose children participants. This results suggest that gender had an effect on individual variability of fNIRS signals in response to auditory stimuli therefore gender matching is important for studies of brain function using fNIRS.

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