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Does Gender Matter in Motor Imagery BCIs?

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Introduction: A major issue in application of Motor Imagery Brain-computer interfaces (MI-BCI) is BCI inefficiency, which affects 15-30% of the population [1]. Several studies have tried to examine the effect of gender on MI-BCI performance [2,3], however the reports remain inconsistent due to small sample sizes and unequal gender distribution in past research. Hence, this study aimed to address this gap by collecting a large sample of female and male BCI users and investigating the role of gender in MI-BCIs in a reliable and generalizable manner.

Methods and Results: Using openly available datasets [1,2,4,5], we gathered a large EEG dataset including 248 subjects (123 females, 125 males, $M_{age} = 23.86$) who completed a similar two-class (left vs. right hand) MI protocol. Our analysis consisted of extracting Mu Suppression Index, which is indicative of mu-band (8-13 Hz) suppression in contralateral hemisphere compared to the ipsilateral one [1]. The Mu Suppression Index was calculated separately for each task (left and right-hand imagery) and then compared between gender groups. The results indicated no significant difference in the Mu Suppression Index of left ($t(246) = -1.69, p = .09$) and right MI ($t(246) = 1.26, p = .21$) between women and men.

Discussion: Contrary to the previous reports that suggest females can better modulate mu rhythm desynchronization during the MI task [1,6], our findings show no evidence for such superiority when the sample is sufficiently large and balanced to suppress the confounding effect of other variables such as an individual's personality and cognitive skills [2].

Significance: The findings shed light on the BCI inefficiency problem and guide development of future MI-BCI systems, e.g., by reconsidering gender-specific classification approaches [7].

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