INDIVIDUAL DIFFERENCES IN CALCULATING POSTERIOR PROBABILITY: DO STATISTICS EDUCATION AND MATH PROFICIENCY MATTER?

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Educators may be interested in the factors that are associated with probabilistic reasoning so that they can better understand the needs of their students. The purpose of this study is to examine individual differences that may predict success in solving a posterior probability problem, specifically prior statistics education and math proficiency. Previous research findings on these relations have been mixed, and they differ depending on the type of reasoning involved. As one might expect, statistics education is often associated with better performance on probabilistic reasoning tasks (Fischbein & Schnarch, 1997). However, statistics education is associated with an increase in the misconception that all events are equally probable (i.e., equiprobability bias), perhaps due to the emphasis on randomness in statistics education (Morsanyi et al., 2009). Focusing on the randomness of an event occurring, without considering other factors that affect probability, may increase the equiprobability bias. There are also mixed findings regarding relations between math proficiency and performance on probabilistic reasoning tasks (e.g., Johnson & Kuennen, 2006; Stanovich & West, 1998). For example, Stanovich and West (1998) found that SAT math scores were positively associated with being able to identify important information in a posterior probability problem, although this did not result in improved accuracy in posterior probability problem solving.

Undergraduate students ($N = 210$) were given a posterior probability problem to solve and provided self-reports of their statistics education and standardized math test scores (ACT or SAT). Approximately 20% of the students solved the problem correctly. Students who answered the problem correctly ($M = .59$, $SD = .55$) tended to have taken more statistics courses than those who solved the problem incorrectly ($M = .37$, $SD = .50$), Exp(B) = 2.25, $p = .02$. In addition, students who solved the problem correctly reported ACT or SAT scores in higher percentiles ($M = 94.76$, $SD = 4.80$) than those who solved the problem incorrectly ($M = 89.54$, $SD = 11.16$), Exp(B) = 1.09, $p = .01$. These findings suggest that for student populations with weak mathematics skills or with little statistics background (e.g., introductory statistics students), posterior probability problems may require special attention.

References

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