SECONDARY SCHOOL STUDENTS' UNDERSTANDING OF SAMPLING VARIABILITY

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In this work, we analyse the progression with school year in the understanding of sampling, a key stochastic idea (Burrill & Biehler, 2011) since it brings a bridge between statistics and probability. We particularly draw on Noll and Shaughnessy (2012), who described idiosyncratic, additive, proportional and distributional reasoning of sampling. We continue our prior analysis (Batanero et al., 2020) with 234 high school students (17–18-year-olds), extending the sample with two additional groups of secondary students (157 students: 13–14-year-olds, and 145 students: 15-16-year-olds) to whom we proposed sampling tasks from a binomial population systematically changing the sample size and the value of the population proportion.

In this paper we compare the responses by the three groups in two tasks where the students were asked to estimate the number of heads in flipping four times 10 and 100 fair coins. For each task, the distribution of the ranges of the four values provided by each student was compared with the theoretical distribution of ranges in samples taken from the binomial population. Overall, the variability of the sample proportion was overestimated, and only a minority of students in the different samples achieved distributional sampling reasoning (Noll & Shaugnessy, 2012). However, the percentage of student providing excessive variability in task 1 (100 coins) decreased in the groups with older students ($F=14.5$; $df=2$, $p>.001$ in the Anova test), but the differences were not significant in task 2 (10 coins). These results suggest a better understanding of sampling variability in small than in big sample.

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