LITTLE STATISTICIANS GROW UP: EXPLORING THE CONCEPT OF VARIABILITY IN YOUNG CHILDREN

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Variability is a central concept in statistical reasoning. Indeed, a major goal of most introductory statistics courses is to help students understand and be aware of the omnipresence of variability and the quantification and explanation of variability (Cobb, 1992). However, in curriculum design and in statistics education research, variability has not been given enough attention (Reading & Shaughnessy, 2004).

Despite the widespread belief in the importance of this concept, only recently have educational researchers devoted their attention to the study of how reasoning about variability develops (Garfield & Ben-Zvi, 2005). Current research on the concept of statistical variation has mainly focused on high school and college students (e.g., del Mas & Liu, 2005). These studies demonstrate that it is extremely difficult for students with statistical training – and even for their teachers - to reason about variability. However, little is known about the understanding of statistical variability in young children.

The main aim of this study is to explore intuitive ideas about variability in 4-6-year old children using a quantity judgment task. Specifically, we assessed whether children's responses were affected by increasing levels of stimulus variability. In addition, we investigated the role of age and numerical skills in children's performance.

Participants included 110 children (49% boys) aged 4-6 years recruited in two kindergartens and a primary school in Northern Italy. Children were individually assessed using a computerized task in which they were asked to compare two sets of chocolate bars. In the first set, the mean and standard deviation of the chocolate bars were held constant; in the second set, both were manipulated. A standardized test of numerical ability was also administered.

The key findings were: 1) Children's performance was affected by stimulus variability following a non-monotonic trend. Increasing levels of variability were associated with a decrease in correct responses, but very low levels of variability (i.e., close to 0) were also unexpectedly related to a decrease in response accuracy; 2) Children's performance significantly increased with age following a linear trend; in addition, marked inter-individual differences were found; 3) Statistical and numerical skills were only moderately intercorrelated.

Overall, these results suggest that young children have an intuitive idea of the concept of variability. The reasoning processes underlying this concept are complex and need to be further investigated. The next steps will be to replicate this study among children and young adults to analyze the characteristics of statistical reasoning about variability across different age groups. In our opinion, understanding how children's concept of variability develops is necessary to implement efficient teaching strategies in multiple educational settings.

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