How Should We Use Words like Could? Development in Understanding Epistemic Modal Verbs as Seen Through Modal Judgment Tasks

Epistemic modal verbs are a special class of verbs used to express the possibility of events based on our knowledge of the past, while acknowledging our uncertainty about the future. As listeners, these words are important for calibrating our expectations and actions. For example, if someone tells you that it *might* rain, you will be less likely grab your raincoat than if someone tells you that it *should*. This is a product of scalar implicature: given that modals can be organized on a continuum of event likelihood or belief, using a weaker modal expression like *might* typically implies that the speaker does not feel licensed to use a stronger expression like *should* (Horn, 1972; Reyna, 1981).

Previous studies investigating children's understanding of epistemic modal verbs have focused on contrasting certain versus uncertain outcomes (Hirst & Weil, 1982; Noveck, Ho, & Sera, 1996; Ozturk & Papafragou, 2015). These studies often interpret their findings in terms of the child's ability to reason about the speaker's knowledge, and suggest that a mature understanding of epistemic modals involves a transition from logical interpretations ("*might* rain" is compatible with a world in which raining is highly likely) to pragmatic interpretations (*might* is dispreferred if the stronger modal *should* is licensed). Here, we focus on how children map the scale of epistemic modals onto their developing understanding of probabilities (O'Grady et al., 2019) to communicate events. We directly compare adults' and children's preferences across a range of epistemic modal verbs (*could*, *can, should*, and *will*) to express events at varying levels of uncertainty.

Children (N= 44, 4-7 years, M_{age}=5.5) and adults (N=21, M_{age}=20) were familiarized with images of a gumball machine containing varying proportions of green and purple marbles. On each critical trial, participants were shown displays with 20%, 80% or 100% green marbles (Figure 1). Two characters then described the chance of getting a green marble using contrasting modal statements (e.g., a green marble "*should* come out" versus "*could* come out"), and children pointed to which character "got it right."

As expected, adults linked weaker modals (*could, can*) to lower probabilities, and stronger modals (*should, will*) to higher probabilities (Figure 2). Children's choices also scaled with the actual probabilities of the machine producing a green marble (i.e., they were more likely to choose *will* over *should* and *should* over *could* to describe greater proportions of marbles), though their rates of selecting the stronger modal were significantly lower than adults' (Figure 3). They also diverged from adults in their expressions of deterministic outcomes, and use of *will*: while adults reserved *will* exclusively for 100% probability outcomes, children applied it to 80% probabilities, and did not reliably select it for 100% probabilities. Our results demonstrate that 5-year-old children show some understanding of the relative strengths of different modal verbs, and that their developing understanding of future event probabilities may contribute to their difficulty using modal expressions pragmatically. Future work will continue to explore how children's linguistic representations of probability relate to their understanding of formal concepts related to uncertainty.

Word Count: 500

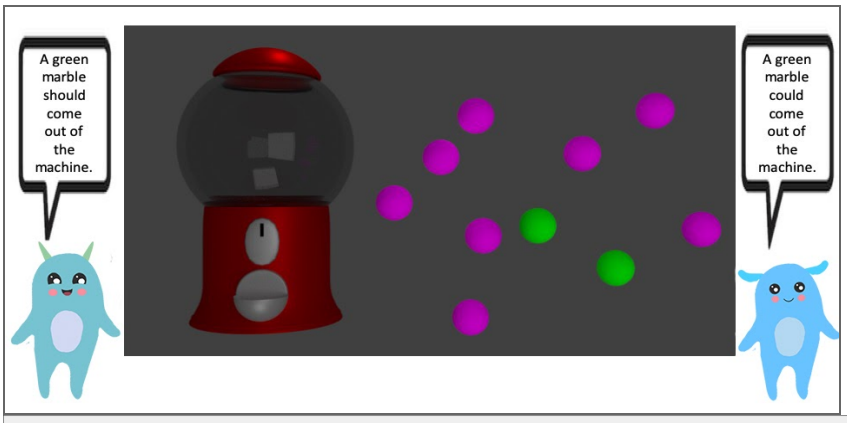

Figure 1. Sample trial where subjects chose between 'should' versus 'could' to describe a 20% probability outcome.

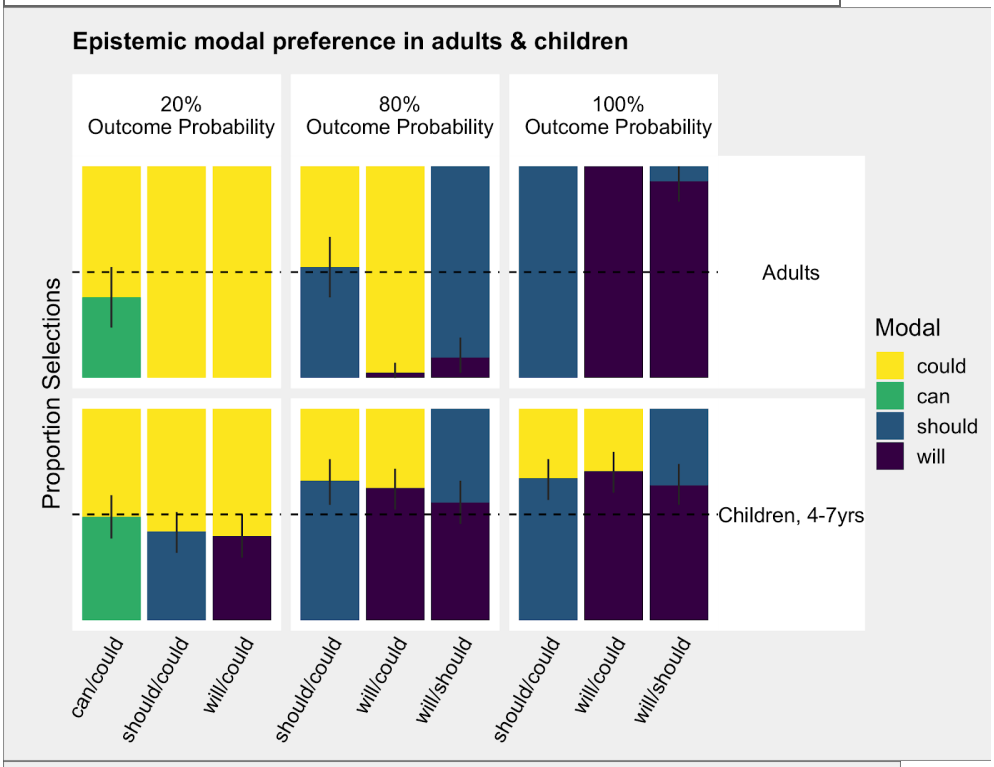

Figure 2. Modal selections by outcome probability and pair for adults (above) and children (below)

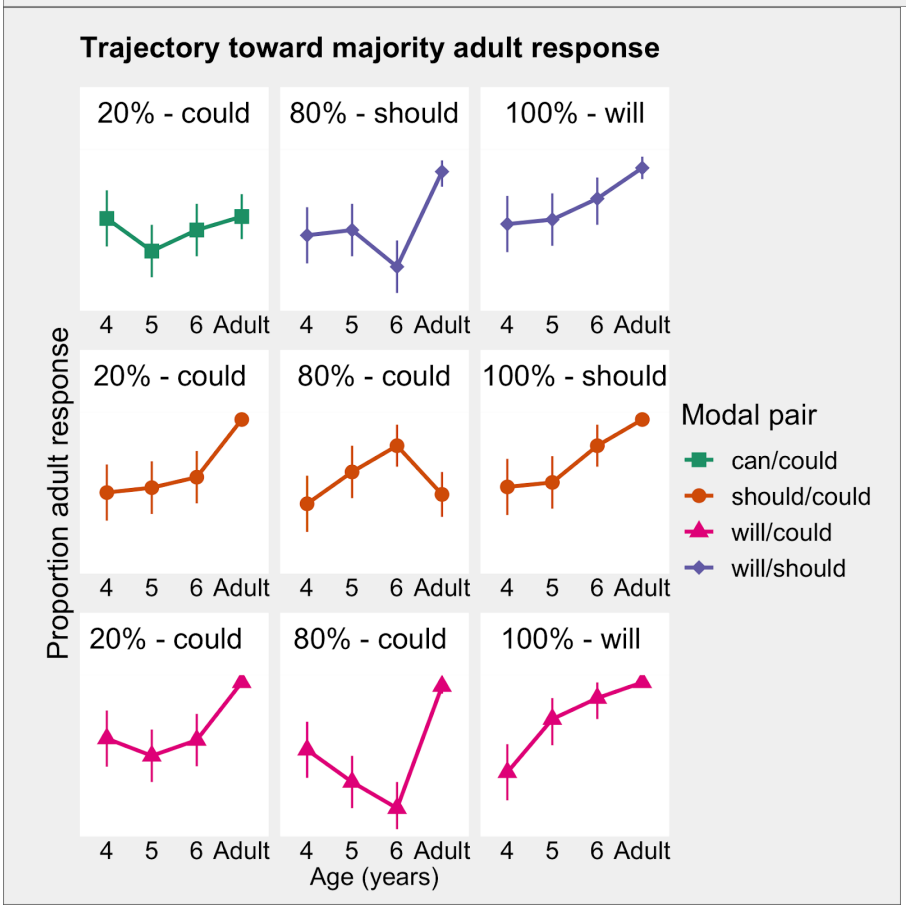

Figure 3. Proportion of children that displayed an adult response by each age