

The value of linguistic redundancy in human-robot communication: A comparison of younger and older adults

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Purpose In recent years, there has been a significant increase in the development of social robots designed to provide assistance or companionship to older adults (Pu et al., 2018; Zafrani & Nimrod, 2018). Although these technologies involve spoken communication, little research has focused on how older adults process language produced by social robots in real time. This is an important consideration given that the inaccurate or slow interpretation of even a single word can have a cascading effect on the comprehension of an entire utterance. Consequently, the goal of communication such as completing a particular task could be performed incorrectly or abandoned entirely. The present study explores factors that could optimize older adults' real-time comprehension during human-robot communication. The specific question is whether and when the inclusion of technically redundant information might improve real-time comprehension in older adults as a robot refers to objects in the immediate environment. **Method** Thirty-six younger (M=19) and 36 older (M=73) adults followed spoken instructions from a Furhat robot (Gen2) to tap on one of eight objects displayed on a large touchscreen (Figure 1). We manipulated the verbal instructions so that target description contained either an unnecessary color/state adjective (e.g., tap on the purple/closed umbrella), or no adjective (e.g., tap on the umbrella). Although the latter case would be sufficient for identifying the unique target (e.g., no other umbrellas), the modified instruction could potentially facilitate real-time comprehension by narrowing attention to the intended target (Tourtouri et al., 2019). To further examine this effect, we manipulated whether or not the target was accompanied with another object (a "competitor") that shared the attribute described in the adjective (e.g., closed/purple book). **Results & Discussion** Eye tracking data measuring the point at which the target object was identified, revealed that the benefit of redundant information depends on the situational context and the type of adjective. Color adjectives facilitated comprehension only in the competitor absent condition, whereas state adjectives impaired comprehension in the competitor present condition (p 's < .001). It is evident that facilitation is greater when overspecification narrows visual attention to only one intended target, namely in the no competitor condition, and when the adjective highlights salient object properties. The current results inform the future design of effective communicative artificial agents.

References

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Figure 1. Experimental setup.