Speech Rate of Short vs. Long Interrogative Sentences in Human-Directed vs. Device-Directed Dialectal Arabic Speech

Recent research has demonstrated growing interest in the phonetic differences between device-directed speech (DDS) and human-directed speech (HDS). While previous studies have extensively examined device-directed speech in various mainstream English varieties, including African American English (Cohn et al., 2024), dialectal variations of Arabic have been notably underrepresented in this research domain. This study addresses this gap by investigating how speakers of dialectal Arabic across different age groups modify their speech patterns when interacting with AI voice assistants compared to human interlocutors.

The experimental design employed a controlled methodology wherein twenty participants (teenagers and adults) who speak dialectal Arabic were recorded producing ten interrogative sentences under three distinct communicative conditions: addressing a familiar human, an unfamiliar human, and a voice assistant (ChatGPT). The interrogative sentences were carefully controlled for syllabic length, comprising two categories: shorter sentences (7/8 syllables) and longer sentences (14/15 syllables), with ten sentences per condition. Speech rate, measured in syllables per second (SpS), served as the primary dependent variable and was analyzed using a Mixed Linear Model to account for both fixed and random effects.

Results revealed significant differences in speech rate across the communicative conditions. Participants demonstrated a measurable decrease in speech rate when addressing the AI assistant (ChatGPT), with a mean of 5.21 SpS. In contrast, the familiar human condition elicited significantly faster speech, with a mean rate of 5.54 SpS. Sentence length also emerged as a significant factor influencing articulation rate, with eight-syllable sentences consistently produced at a faster rate compared to their longer counterparts across all conditions. Interestingly, the analysis indicated that age differences between the groups did *not* reach statistical significance. While teenagers exhibited slightly slower speech than adults (5.31 versus 5.51 SpS, respectively), this difference was not statistically meaningful. This finding suggests that age does not substantially influence speech production patterns (speech rate in particular) across the different communicative conditions and sentence types examined in this study. Furthermore, both age groups demonstrated similar speech rate patterns across all conditions, with shorter sentences consistently articulated at an accelerated pace.

These findings contribute to our understanding of how dialectal Arabic speakers modify their speech when interacting with different interlocutors, particularly highlighting the systematic adjustments made when addressing AI systems versus human conversation partners. Future research directions should expand this investigation to encompass a broader range of Arabic dialectal variations and sentence types to verify the generalizability of these findings. Additionally, examining the influence of contextual factors on participants during conversations under varied conditions would provide valuable insights into the pragmatic

dimensions of device-directed speech. Such research has important implications for the development of AI systems that can effectively respond to and accommodate dialectal and phonetic variations in users' speech, ultimately enhancing the accessibility and effectiveness of voice-based technologies for diverse linguistic communities.