

Effects of unexpectedness on turn-transitions in adults with Autism Spectrum Disorder

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Turn-taking behaviour in human conversation has been the topic of research for almost four decades [1]. For successful communication, turns have to be precisely coordinated. Across a large number of languages and speakers, a shared preference for short-gap turn transitions (of typically around 200 ms) has been shown in previous research [2]. Long intervals of silence, on the other hand, are generally rare. Since the planning of even a short utterance takes far longer than the 200 ms typical for short-gap transitions, correct predictions about the end of an interlocutor's turn are essential. Such predictions require great cognitive resources and, more specifically, perspective-taking abilities. Impairment of those abilities is a characteristic feature of Autism Spectrum Disorder (ASD), a neurodevelopmental disorder that also typically involves general difficulties in social communication [3]. The vast majority of research on turn-taking to date has been conducted on subjects without any kind of mental disability or disorder. Thus, there are no clear results on the turn-taking behaviour of individuals with ASD so far. In our study we recorded 14 adults with ASD and 14 control (CTR) participants without a diagnosis of ASD using the Map Task paradigm [4]. In this task, participants have to work together in pairs (dyads) to transfer a given route from one participant's map to the other without any visual contact and only through the use of spoken language. All participants completed two Map Tasks, switching the roles of instruction giver and instruction follower after completion of the first map. All maps in our task consist of 9 to 10 landmark items. 2 landmarks per task unexpectedly differ from one map to the other in the form of missing, duplicated or deviating items (Mismatches). In this contribution, we specifically investigate and compare the effect of these Mismatches on the timing of turn-transitions in both Maps completed by each dyad. We measured the timing of turn transitions after the introduction of new landmarks and employed the measure of Floor Transfer Offset (FTO) [5], in which positive values represent gaps and negative values represent overlaps. For Map 1, we predicted that, in the case of Mismatches, participants would produce a higher proportion of long gaps measuring 700ms or longer. Such long gaps have been reported to precede cases of unexpected or dispreferred responses to questions as well as repair initiations [5]. Indeed, after the introduction of mismatching landmarks, long gaps (≥ 700 ms) were the most common type of turn transition for both the ASD group (74%) and the CTR group (55%) (see Fig. 1, left panel; mean FTO values can be found in Table 1). After Matches, however, only 8% of transitions in the CTR group consisted of long gaps, while the ASD group still produced a relatively high proportion of long gaps with 41%. In this sense, CTR subjects clearly distinguished Matches from Mismatches in their turn-taking behaviour, by producing a much greater amount of otherwise unusual long-gap transitions following Mismatches compared to Matches ($\Delta = 47\%$). Speakers with ASD, on the other hand, produced a high proportion of unusually long gaps even in the "default" case of expected and predictable information and therefore behaved more similarly across conditions ($\Delta = 14\%$). In effect, ASD speakers reacted to the expectable information in the Match condition in a way that CTR speakers did only in cases of unexpected information. For analysis of the second Map, i.e. after participants had switched roles, we assumed that subjects would fully expect Mismatches to occur in the task at this point of the experiment. Consequently, we predicted that there would be fewer long-gap transitions overall and that there would be a less pronounced difference between turn transitions following Matches versus Mismatches. Indeed, we find that for Mismatches in Map 2, only 16% of turn transitions in the ASD and 33% of transitions in the CTR group consisted of long gaps (≥ 700 ms; see Fig. 1, right panel). There were even fewer long gaps following Matches, with a proportion of 16% for the ASD group and 13% for the CTR group. Thus, CTR speakers produced considerably fewer long-gap transitions after Mismatches in

Map 2 than in Map 1 ($\Delta = 22\%$), but produced a similarly low proportion after Matches in both Map 1 and Map 2 ($\Delta = 5\%$). ASD speakers, on the other hand, drastically reduced their proportion of long-gap transitions in Map 2 to only 16% in both the Mismatch ($\Delta = 58\%$) and Match ($\Delta = 25\%$) conditions. Although the ASD and the CTR group behaved more similarly in Map 2, the CTR group actually produces slightly more long gaps in the case of Mismatches than the ASD group. In Map 2 mismatching landmarks are not unexpected any more. However, CTR subject still produce more transitions that *would be* appropriate in case of genuine unexpectedness. It is tempting to speculate that this might be done for the benefit of the interlocutor and therefore for social rather than functional reasons, and that the same is not the case for the ASD speakers due to a lack of social motivation. More generally, our findings can be related to subjective time experience in ASD, which is characterized by a lack of flexibility in planning the near future and a constant fear of interruption [6]. It might be the case that, for individuals with ASD, *all* new information, even when it is predictable as in the Match condition, is somewhat disruptive to a rigidly planned near future, leading to perceived unexpectedness and consequently longer gaps in turn transitions. For CTR speakers, a similar feeling of interruption is only caused by unexpected events, as in the Mismatch condition. The fact that these group differences are greatly diminished in Map 2 might be due to the fact that the conversation by then follows a practiced and highly predictable pattern that does not require any great degree of flexibility from the interlocutors.

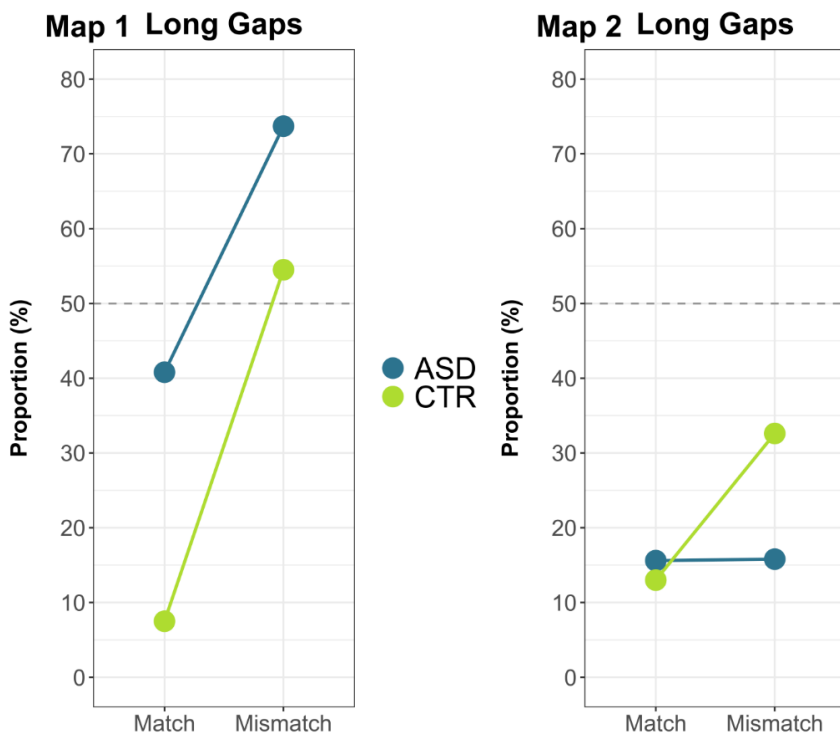


Figure 1: Proportions of long gaps ≥ 700 ms as a percentage of all turn transitions (gaps and overlaps) by group and Match/Mismatch. Map 1 in the left panel; Map 2 in the right panel. ASD group in blue; CTR group in green.

References:

[1] Sacks, H., Schegloff, E. A., & Jefferson, G. (1974). A simplest systematics for the organization of 501 turn taking for conversation. In *Studies in the organization of conversational interaction* (pp. 7-55). 502 Academic Press.

[2] Levinson, S. C. (2016). Turn-taking in human communication: Origins and implications for language 486 processing. *Trends in Cognitive Sciences*, 20, 6-14.

[3] Chasson, Gregory, and Sara R. Jarosiewicz. "Social competence impairments in autism spectrum disorders." *Comprehensive Guide to Autism* (2014): 1099-1118.

[4] Anderson, A. H., Bader, M., Bard, E. G., Boyle, E., Doherty, G., Garrod, S., ... & Sotillo, C. (1991). The HCRC map task corpus. *Language and speech*, 34(4), 351-366.

[5] Kendrick, K. H., & Torreira, F. (2015). The timing and construction of preference: A quantitative study." *Discourse Processes*, 52, 255-289.

[6] Vogel, D., Falter-Wagner, C. M., Schoofs, T., Krämer, K., Kupke, C., & Vogeley, K. (2019). Interrupted time experience autism spectrum disorder: empirical evidence from content analysis. *Journal of autism and developmental disorders*, 49(1), 22-33.

Table 1: Mean and SD FTO values of turn transitions by group, Map and Match/Mismatch.

Mean FTO values (SD in brackets)	Map 1		Map 2	
	Match	Mismatch	Match	Mismatch
ASD	529 ms (879)	1158 ms (1321)	350 ms (856)	456 ms (623)
CTR	101 ms (491)	857 ms (744)	273 ms (304)	594 ms (605)