

# Adaptation and Interaction in Collaborative Problem Solving

Christine Howes,<sup>†</sup> Patrick G. T. Healey,<sup>‡</sup> Pietro Panzarasa<sup>‡</sup> and Thomas Hills\*  
christine.howes@gu.se

<sup>†</sup>University of Gothenburg, Sweden

<sup>‡</sup>Queen Mary University of London, UK

\*University of Warwick, UK

## 1 Introduction

Much problem-solving research has investigated if and why ‘two heads are better than one’ (Hill, 1982), but typically posits that it is exposure to the ideas provided by another person’s attempted solutions that provide process gain, without investigating what the interaction itself contributes to joint problem solving.

Early work found that individuals out-perform groups, but statistical pooling of individuals means this is not a fair comparison (‘production blocking’; Kerr and Tindale, 2004). In a non-interactive paradigm, using online methods so participants can contribute ideas simultaneously, Nijstad et al. (2002) found that individuals exposed to others’ ideas performed better than those who were not. However, Ziegler et al. (2000) found no improvement for interacting groups, but noted that groups produce more ‘irrelevant utterances’. The role and effect of these utterances, which allow conversational partners to coordinate with each other, is not investigated.

We hypothesise that there are pragmatic effects associated with the need to adapt to a conversational partner that affect task performance, independently of the informational content.

## 2 Method

We compared individual and dyadic performance on the Alternative Uses Task (AUT; Gilhooly et al., 2007) using a text chat interface (DiET chat tool; Healey et al., 2003). The AUT is a task for assessing creativity, in which participants are asked to come up with novel uses for a common item (e.g. *brick*). There were three conditions; i) *interactive* – participants came up with solutions together; ii) *playback* – participants came up with solutions on their own but saw the suggestions made by a previous participant; iii) *individual* – participants completed the task alone. Nominal pairs were created by interweaving the turns of two individuals. This allows us to independently vary the informational content and interactivity that participants were exposed to.

## 3 Results and Discussion

Participants in the *interactive* condition produced more turns per item (*interactive* = 33.29; *playback* = 22.25; *individual* = 17.58). However, only 59% of these were suggested uses – nearly half of their turns are used in managing the dialogue e.g. offering feedback. Despite this and the time limit, there was no difference in the average number of uses per “dialogue”<sup>1</sup> between the conditions (*interactive* = 19.60; *playback* = 19.90; *individual* = 16.38).

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<sup>1</sup>For the *playback* condition, these include the replayed turns; for *individuals* these are constructed by combining the responses of two individuals.

Interactivity changes the nature of responses – *interactive* participants are more likely to build on a previous turn in the conversation than those in the *playback* condition, despite receiving identical information (figure 2). *Interactive* participants don't produce significantly more complex ideas in general (figure 3), but do produce more complex ideas when a turn is linked to a previous turn (figure 4); following leads to more elaboration – but only if there is genuine interactivity. These results indicate that participants actively adapt to their conversational partner, and this influences their responses in joint problem solving tasks – in a way that is not explained by the informational content.

Tag	Value	Explanation	kappa
<b>is-use</b>	y/n	For all turns: is this turn a suggested use for the item?	0.86
<b>continues</b>	sentence ID	For turns where <b>is-use</b> = y: does this turn develop or repeat a previous suggestion? If so, which one?	0.68
<b>complexity</b>	1-5	For turns where <b>is-use</b> = y: how complicated/elaborate is the suggestion?	0.83

Table 1: Annotation Tags

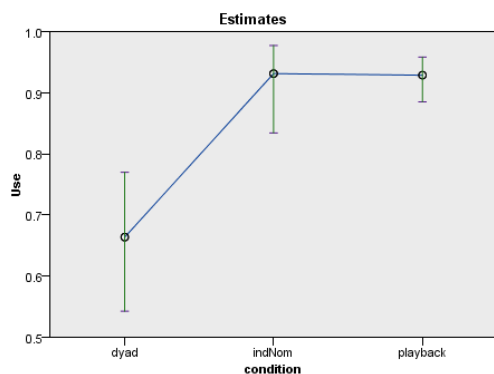


Figure 1: Marginal means of proportion of turns that are a use

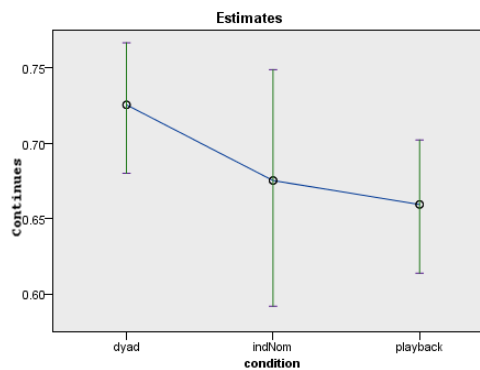


Figure 2: Marginal means of proportion of idea turns that follow a prior turn

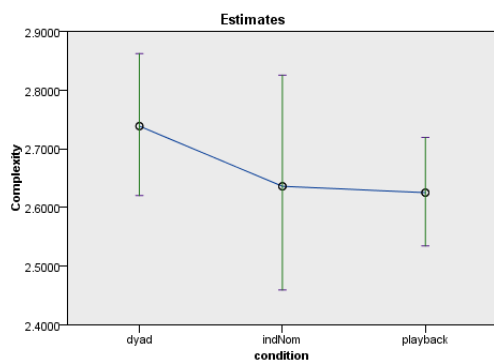


Figure 3: Marginal means of complexity of ideas

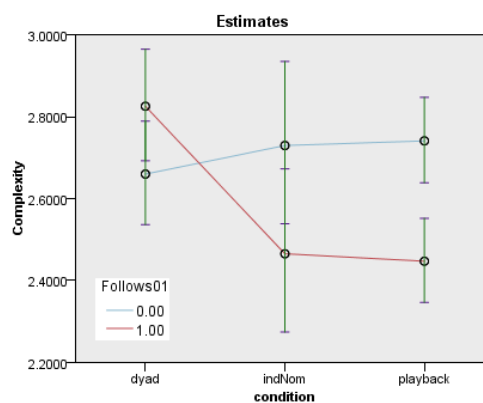


Figure 4: Marginal means of complexity of ideas by whether they follow a prior turn

## References

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