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COMMENTARY

The critical roles of errors and individual differences in bilingual translation*

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Multilink moves the field a step forward in being able to make clear predictions about how a bilingual's languages interact in a variety of tasks. It addresses some shortcomings of the BIA (Dijkstra, van Heuven & Grainger, 1998) and BIA+ (Dijkstra & van Heuven, 2002) models, which did not explain performance from bilinguals of varied proficiency levels or on translation tasks. However, there are still gains that can be made – Dijkstra, Wahl, Buytenhuijs, van Halem, Al-jibouri, de Korte, and Rekké (2018) themselves point out that there are additional ways in which they plan to expand the model.

Here, I describe two aspects of translation that are particularly important for future development. The first of these is the nature of errors. Dijkstra et al. (2018) note that "One of the principle challenges in the word translation process is to ensure that the correct translation is selected from among a large set of co-activated representations.". However, errors are regularly made during translation. In what follows, I describe three studies that examined the nature of errors made during translation. In each, unique findings were obtained from the error analysis that went beyond what could have been obtained from the reaction time and error rate analyses.

Kaushanskaya (2018) examined the type of errors made by bilinguals and monolinguals in a novel vocabulary learning task immediately after learning and following a delay. She compared the relative proportions of surface (phonological) and deep semantic errors in translation and found that bilinguals made more deep errors than monolinguals initially. Furthermore, only bilinguals made deep errors in similar proportions at both the immediate and delayed tests; by contrast, the monolinguals made fewer deep (and more surface) errors initially. Notably, the error analysis was necessary to discover these differences between monolinguals and bilinguals; they were not revealed in the accuracy analyses, which simply showed overall accuracy advantages for bilinguals and for immediate testing.

In Miller and Kroll (2002), key additional information was also gleaned by examining the nature of errors made during translation. They tested proficient bilinguals in a translation variant of the Stroop task in which participants were asked to translate a target word that was followed by a distractor after 200 or 500 ms. In some instances, participants named the distractor itself or translated the distractor rather than the target word, particularly when the distractor was in the language of production (Experiment 1). Furthermore, participants were more likely to name the distractor in the short SOA condition when it was semantically related to the correct response. Miller and Kroll concluded that the language of production is selected early in the translation process because by 500 ms participants did not make many errors of these types. These data are important because they reveal aspects of the translation process, including the timecourse along which selection takes place, and again go beyond what was learned from the reaction time and error rate analyses.

Finally, Tokowicz, Michael, and Kroll (2004) examined non-response and semantic errors made by moderately-proficient bilinguals during a translation task as a function of the participants' working memory and study abroad experience. Only individuals with higher working memory and more study abroad experience made similar numbers of non-response and meaning errors, whereas other individuals made significantly more non-response than meaning errors. Tokowicz et al. concluded that individuals with more study abroad experience have a strong desire to communicate, and therefore set a lower threshold for giving a semantically-related response. However, doing so requires higher working memory because the intended translation has to be held in memory while the alternative translation is activated or attended to. Thus, the nature of the errors revealed an interaction between study abroad experience and working memory that was not found in the overall accuracy or reaction time data.

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How might these two constructs, individual differences and errors, be implemented in Multilink? Individual differences like working memory could be instantiated by varying resting level activation, which is used in Multilink to simulate frequency effects. Alternatively, this could be accomplished by adjusting recognition thresholds across individuals. Note that Multilink currently underestimates the variance of empirical data, partly because it does not include the variance associated with individual participants. If individual differences associated with factors such as working memory were modeled in Multilink, it would likely account for additional variance in the empirical data.

With respect to simulating errors, we must first make some assumptions regarding what gives rise to certain types of errors during translation. Focusing on semantic errors, which are the most relevant, it is unlikely that bilinguals have incorrectly learned the translations because the proportion of semantic errors goes up with increased second language proficiency (e.g., Tokowicz et al., 2004; Tseng, Chang & Tokowicz, 2014). Therefore, it is most likely that Multilink would have to implement spreading activation between concepts to enable semantic errors to occur during translation. Specifically, these errors may arise because an individual does not know or have sufficient activation of the output node for the target word, but due to spreading activation to semantically related words, a related output node is the most highly activated and is therefore selected for output. At this point, "semantic spreading of activation between associated representations is left unconsidered" (Dijkstra et al., 2018) and will be developed in more detail later. This future development is essential because errors are a normal and common part of the translation process and therefore models of this task should be able to explain how they occur.

In conclusion, studies examining the nature of errors made during translation provide us with information about the manner in which translation proceeds that would not have been gained by examining translation reaction times or error percentages alone. And, individual differences (at least in the form of working memory) are associated with second language processing and proficiency (for a review, see Linck, Osthus, Koeth & Bunting, 2014). Although no model can account for all aspects of processing, if Multilink were extended to model these particular characteristics of bilingualism, the field would benefit greatly.

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