Second Language Research 26,1 (2010); pp. 5–11

Innovative and quantitative methods for bilingualism research

Monika S. Schmid *University of Groningen, The Netherlands* and **Elise Dusseldorp** *TNO, Quality of Life* and *Leiden University, The Netherlands*

Tempora mutantur, nos et mutamur in illis.

To the scientist, external change often implies drastic and challenging developments, particularly to the ways in which the data on which scientific investigations are based are observed, collected and analysed, as well as the pressure to adapt to these changes. Over the past decades, the technological revolution has brought us microcomputers, digital recording devices, and non-invasive technologies that can measure and record aspects of behaviour, such as brain and muscle functions, which were hitherto not accessible to observation. These developments have changed the ways in which linguists conduct their studies beyond all recognition. While the Saussurean tenet that *langue* itself cannot be observed – but only studied through its instantiations in *parole* – still holds, huge strides have been made in investigating the physical, neurophysical, and sociopsychological correlates of language production and processing, which may allow insights of a different – and possibly deeper – kind than was possible before. Similarly, new communications technology permits data collection on a previously unimaginable scale, so that large corpora are now available that can be both an opportunity and a challenge for statistical methods.

The application of such new methods and technologies to research on bilingualism is often affected by a time lag with respect to their adoption in monolingual contexts. The widespread bias that assumes the monolingual mind and monolingual development to be the 'normal' state of things, and multilingualism the 'exception', prevails. This is understandable to some

Address for correspondence: Monika S. Schmid, English Department, Faculty of Arts, University of Groningen, PO Box 716, 9700 AS Groningen, The Netherlands; email: m.s.schmid@rug.nl

 10.1177/0267658309337616

degree, as investigations of bi- or multilingual speakers invariably return results that are particularly difficult to interpret. Establishing a monolingual baseline may therefore be a prudent course of action. At that stage, however, the dissemination of novel approaches to second language research may be problematic, and investigators can sometimes find it challenging to keep up with developments, particularly where they occur outside their own focus of interest.

The present issue of *Second Language Research* attempts to address this by bringing together a number of contributions on innovative and quantitative methods for second language research. All articles were written by experts who not only have extensive theoretical and technological knowledge of these methods, but have witnessed their development and are therefore in a position to judge to what degree they provide a true and valuable contribution to scientific insights, and are not merely – in the immortal words of *Monty Python*'s Michael Palin – 'machines that go bing'.

The first contribution in the issue focuses on phonetics and articulation. Mennen, Scobie, De Leeuw, Schaeffler and Schaeffler conduct a survey of methods used in exploring articulatory phonetics and, in particular, phonetic settings: the language-specific tendency to configure the vocal apparatus. Languages differ in the ways in which speakers hold their lips, tongue, jaws, etc. during or just before or after speaking, and this influences, to some degree, overall pronunciation. To what degree second language learners can be successful in adapting their phonetic settings has, until relatively recently, been a matter of some debate, as it was impossible to directly and accurately observe the ways in which speakers hold and move their vocal apparatus. Ingenious techniques – such as spraying the tongue with chocolate powder and then observing evidence for where it had touched the palate – were employed, but insights generally had to be extrapolated from analyses of the speech sounds.

Mennen *et al.* give an overview of technological innovations that allow the actual observation of such movements, through techniques such as flesh-point tracking (where markers are attached to the lips or tongue and then followed during speech), ultrasound and electropalatography. They complete their review with a discussion of recent improvements and innovations with respect to more conventional (as well as cheaper and less invasive) acoustic measures, and the insights these allow. Their discussion encompasses the application, potential contribution and advantages of each of these methods, as well as their limitations and disadvantages.

They conclude that both articulatory and acoustic investigations will be valuable in furthering the understanding of phonetic settings and second language (L2) acquisition, raising a number of important questions with respect to issues such as the perceptual distance between languages and the difficulty or easy of acquiring an L2 that is more or less similar to the first language (L1) in phonetic setting.

The second contribution, by van Hell and Tokowicz, addresses the use of event-related potentials (ERPs) for the investigation of (morpho) syntactic processing by L2 learners. The question of whether L2 processing is fundamentally different or fundamentally the same as L1 processing has been at the root of many theoretical debates in second language acquisition (SLA) research, but until relatively recently such investigations were faced with a dilemma that is not unlike what was pointed out for phonetic research above. What could be observed was only the output that speakers produced: ways in which certain grammatical structures were used or, more usually, responses on grammaticality judgement tasks. The status of such tasks has long been controversial: do grammaticality judgements tap implicit skills, i.e. do they require the speaker to access internally represented knowledge without being consciously aware of that knowledge?

In online speech processing, hearers cannot access the intermediate representations that they construct to interpret the message, nor can they choose – on being exposed to a meaningful sentence in a language that they know – to hear that as anything else than a linguistic utterance of which they can make sense (Tyler, 1992). However, since grammaticality judgement tasks require the listener to decide whether an error has occurred or not, and to reflect on its nature, Tyler judges them to occupy an intermediate position between online and offline tasks (although they reflect online processes).

The use of ERPs can provide a better insight into actual grammatical processing, as this technology allows monitoring neural activation as language processing unfolds over time, and therefore eliminates the element of conscious reflection and metalinguistic judgement inherent in behavioural measures. Van Hell and Tokowicz give an overview of the application of the ERP technique in studies on late L2 learners at different L2 proficiency levels, and present the (sometimes controversial) evidence for differences and similarities in (morpho)syntactic processing between L2 learners and native speakers, and among L2 learners at different levels of L2 proficiency. They suggest that ERPs can reveal subtle differences in grammatical processing that are difficult

to detect, or that might remain undetected, with behavioural tasks. ERPs also demonstrated that L2 learners may be sensitive to grammatical violations earlier than shows up in their behavioural responses: L2 learners' ERP responses may show sensitivity to grammatical violations, while overt accuracy judgements are (still) at chance. These findings suggest that ERPs are an important source of converging evidence in tracking the development of grammatical processing in SLA and can provide insights that cannot be gained from analyses of behavioural data alone.

While the contributions by Mennen *et al.* and van Hell and Tokowicz discuss the impact of technological advances on the study of features that have traditionally and unambiguously been within the realm of mainstream linguistic investigation – phonetics and syntax – Gullberg's article argues that gestures, which many would consider paralinguistic, should also be granted the status of forming part of the linguistic message. She presents evidence that the symbolic movements that speakers perform in formulating their utterances are not only time-locked to certain points of the utterance, serving both internal and communicative functions, but that they also vary crosslinguistically, making them a challenge for L2 learners. In particular the ways in which conceptualization differs between languages is reflected in gestural systems, so that a comparison of gestures used by native speakers and L2 learners can shed light on the differences of the semantic–conceptual systems that these speakers draw upon while formulating their messages.

Gullberg's review of existing work reveals that the use of gestures by bilinguals and L2 learners differs in systematic and interesting ways from those of monolinguals. Investigations of placement verbs, for example, show differential rates of acquisition of the verbs and their gestural correlates: some learners apply the verb in an L2 fashion but accompany it by L1-like gestures, while others appear to have acquired native-like gestures. Similar patterns obtain for other aspects of gesturing, for example with the temporal alignment of sentence constituents and gestures. This suggests that the development of the conceptual system of event representations is a continuum, encompassing both speech and gesture, and that both should be investigated in order to gain a full picture of crosslinguistic influence: the analysis of gesture can provide a new window on the interface between semantic–conceptual and syntactic information in lexicalization.

Gullberg concludes her contribution by pointing out a number of methodological considerations for investigations of gesture and names

some important questions for future investigations, such as the role of gestures in facilitating L2 learning and in encoding information structure.

These three contributions, which form the first part of the present issue, all underscore one of the most serious constraints of linguistic investigation: the analysis of individual data – be it of phonetic, syntactic or paralinguistic features – is extremely time consuming. This implies that the data samples on which such analyses are based are usually too small to satisfy the requirements imposed in other social sciences.

Such comparatively small sample sizes have their own advantage: in order for statistical analyses to become significant, the differences have to be larger than in bigger corpora, so that the chance of a false rejection of the null hypothesis (a Type I error) is smaller. On the other hand, smaller samples increase the danger that, due to lack of power, a difference between experimental and control group which actually exists is not revealed in the analysis.

Larger-scale investigations conducted through means that are less costly may therefore be desirable, ideally accompanying and corroborating smaller investigations of data collected by more traditional means. Wilson and Dewaele present two investigations of large corpora of introspective data and self-reports, collected by means of web questionnaires. Investigations based on such data are becoming increasingly common in other fields of scientific investigation, but their obvious limitations – such as the self-selection of informants and the lack of researcher control – leaves many linguists dubious of their validity and reliability.

Wilson and Dewaele carefully review the benefits and limitations associated with data collected by means of web questionnaires. They argue that, in particular where research on SLA is concerned, the bias of the sample due to the self-selection process of the participants is probably no more serious than in more traditionally conducted surveys, nor is there reason to suspect that responses are less sincere. The benefits of the larger sample sizes effected through this means of data collection, which allows correlations of a large number of dependent and independent variables, they conclude, outweighs the limitations imposed by the medium.

The issue of sample size in a multifactorial design is also addressed by the last contribution in the present issue. Schmid and Dusseldorp investigate a sample collected by the traditional face-to-face method; their sample is comparatively large by linguistic standards. A population

of 106 L1 attriters of German is investigated in an attempt to identify relevant predictors for the attritional process. Their study shows how to reduce a large number of predictors – collected by means of a sociolinguistic, personal background and attitudinal survey – to a set of composite variables with satisfactory internal validity. The impact of each of these composite variables on the attritional process is then demonstrated by means of hierarchical multiple regression analyses and canonical correlation analyses.

The gradual refinement and reduction of the composite predictors demonstrated in this study is important for the larger field of language attrition studies. The development of the L1 in a bilingual setting has, to date, received far less attention than SLA, even though it is becoming increasingly accepted that even instructed L2 acquisition in an otherwise L1 environment may to some degree impact on and change the L1 (e.g. Cook, 2003; Schmid and Köpke, 2007). Existing studies typically investigate more limited sample sizes than is true for other areas of linguistic research: participant recruitment for such studies is more difficult than, for example, in instructed second language acquisition, where learner populations can provide ready-made, age- and education-matched samples with high motivation to participate in testing.

The template provided by Schmid and Dusseldorp's investigation may therefore provide a valuable basis for future investigations. In this context it may be of relevance to note that the composite factors investigated here have been shown to have consistently high internal reliability for other populations in ongoing investigations using similar research designs, such as Cherciov's (in preparation) investigation of Romanians in Anglophone Canada, Dostert's (2009) study of L1 English speakers in Germany, and a comparison of bilingual development among Moroccan Arabic (van der Kooi, in preparation) and Turkish (Yilmaz, in preparation) speakers in The Netherlands. This suggests that the patterns of L1 use and attitudes observed in the L1 German population investigated here are not coincidental, but representative of attriting populations in other settings, and even across a considerably diverse set of linguistic and cultural backgrounds.

Acknowledgements

We would like to express our thanks to the editors of *Second Language Research*, Mike Sharwood Smith and John Archibald, as well as to the former editor, Roger Hawkins, for their support and advice in the

process of compiling the present issue. Our gratitude and appreciation also goes to the colleagues who acted as anonymous *Second Language Research* referees for the contributions represented here, and whose valuable advice and criticism has helped improve the quality of this collection. For their assistance with the editing process, we are grateful to Hanneke Loerts, Teodora Mehotcheva, Amy Sofogiannis, Farah van der Kooi and Gulsen Yilmaz.

References

Cherciov, M. in preparation: Between attrition and acquisition: the case of Romanian in immigrant contexts. PhD dissertation, University of Toronto.

Cook, V. 2003: The changing L1 in the L2 user's mind. In Cook, V., editor. *Effects of the second language on the first*. Clevedon: Multilingual Matters, 1–18.

Dostert, S. 2009: Multilingualism, L1 attrition and the concept of 'native speaker'. Unpublished PhD dissertation, Heinrich-Heine Universität, Düsseldorf.

Schmid, M.S. and **Köpke, B.** 2007: Bilingualism and attrition. In Köpke, B., Schmid, M.S., Keijzer, M. and Dostert, S., editors, *Language attrition: theoretical perspectives*. Amsterdam, Philadelphia: John Benjamins, 1–7.

Tyler, L.K. 1992: The distinction between implicit and explicit language function: evidence from aphasia. In Rugg, M. and Milner, D., editors, *Neuropsychology of consciousness*. New York: Academic Press, 159–78.

van der Kooi, F. in preparation: The development of bilingual proficiency among Moroccan Arabic speakers in the Netherlands. PhD dissertation, University of Groningen.

Yilmaz, G. in preparation: The development of bilingual proficiency among Turkish speakers in the Netherlands. PhD dissertation, University of Groningen.