



Universiteit
Leiden

How replicable are bilingual interactive processing effects?

Applicants

Eligible proposals must have at least two applicants from Humanities, preferably with an interdisciplinary approach.

Supervisor Name	Discipline
Dr. Jurriaan Witteman, LUCL	Neurolinguistics, methodology, statistics
Dr. Leticia Pablos-Robles, LUCL	Psycholinguistics, first and second language processing

Project description

Only results that can be reproduced by an independent study ('replicated'), can be regarded as true scientific discoveries that can be used for theory development (Popper, 1935). Recently, there has been a call for replication research (KNAW, 2018). Because replication in the humanities is still scarce, there are exciting opportunities to use replication research to make the humanities more replicable (Peels, 2019).

A landmark (1000 citations) psycholinguistics study (Dijkstra et al., 1999) found that when Dutch – English bilinguals responded to English words, they were faster when the word exists in both languages (e.g., KIND - "nice" in English, "child" in Dutch) than when the word only exists in English (MIND). Based on the result, the Bilingual Interactive Activation plus (BIA+) theory was developed, that assumes that two languages interact in the mind of bilinguals. However, subsequent small studies could not find all original effects. This raises the question how replicable the results are, but strikingly, there is no independent replication of Dijkstra et al. (1999) yet.

This project will perform the first independent replication of Dijkstra et al. (1999). We will test 75 participants, 2.5 times the original sample size, allowing us to show (1) whether original results are replicable, and if *not* (2) that the true effect magnitude is indistinguishable from zero (Simonsohn, 2015). Last, we will use the replication project as a case study to teach BA students principles of methodology ("Replication as Education") and facilitate a tradition of replication at our faculty.

References:

- Dijkstra et al. (1999). *Journal of Memory and Language*, 41, 496-518.
KNAW. (2018). *Replication studies: improving reproducibility in the empirical sciences*. Amsterdam.
Peels, R. (2019). *Research Integrity and Peer Review*, 4:2.
Popper, K. (1935). *The logic of scientific discovery*. London and New York: Routledge.
Simonsohn, U. (2015). *Psychological Science*, 22(11), 1359–1366.

Research Trainee Profile

Two third year BA linguistics students will be required that have completed the two obligatory methods and statistics courses in the *Language and Cognition* track. BA students are chosen because one of the project aims is to test whether replication work can be used as a tool to teach BA students

principles of methodology. In addition to the two BA students, €500,- is requested to reimburse the 75 participants (€ 6.5 per participant).

The students will be (under the supervision of Witteman and Pablos-Robles) responsible for (1) checking whether the word recognition task that we will program for the study exactly reproduces all procedures in Dijkstra et al. (1999); (2) collecting the data for 75 participants; (3) analysing the data under the guidance of the supervisors and (4) evaluating the extent to which original results have been replicated. These tasks are challenging for the students because it will be their first experience with setting up a replication study (raising philosophical questions about why replication is important), collecting data (raising methodological questions about how to reproduce a study procedure and why certain procedures are used) and verifying whether the original results have been replicated (raising statistical questions about what it means to say that a result is 'replicated'). Additionally, through all stages of the project, *Open Science* principles will be emphasized to make the work as reproducible as possible. The trainees will be included as co-authors on the publication resulting from the work.

Each proposal requests two Research Trainees. Describe the general tasks of the research trainees, how these tasks are academically challenging to the research trainees, whether they need any preliminary knowledge (regarding the topic and/or research methods) and which skills the research trainees should have. Also specify which type of students are eligible to apply (3rd year Ba, Ma, ResMa).

Collaboration

Witteman is an expert in neurolinguistics, methodology and statistics, Pablos-Robles in psycholinguistics and first and second language processing - their combined expertise will be ideal for performing the proposed replication study. Additionally, there will be cross pollination between research and education because the study will serve as a case study to test whether replication work can be used as a tool to teach students methodology and statistics ('Replication as education'). By setting up a replication study, students learn the fundamental principle of science that results need to be reproducible to count as a discovery and to establish the basis for theories. Furthermore, setting up such a study requires that the student carefully examines all the procedures performed (and why), which will enhance the student's understanding of study design. Last, analysing results derived from replication raises the question when results are considered to be similar enough to the original results to count as a replication. During the project, and based on the interactions with the students and their direct feedback, we will develop a 'Replication as Education' manual. The manual can be used in the future by all staff in the BA linguistics to supervise students for a replication project, such as their BA thesis. In this way, the project aims to facilitate the development of a research culture where replication is seen as mainstream scientific work (KNAW, 2018), contributing hopefully in the long run to more replicable psycholinguistics research. Although aimed at linguistics students, because replication is in principle possible in many disciplines in the humanities (Peels, 2019) we will make the manual also suitable for disciplines outside of linguistics (e.g., for qualitative studies). More experience with methodology and replication at the faculty of humanities might strengthen the position of the staff with grant applications in the SSH domain.

If applicable: Describe how your research improves collaboration and cross-pollination between the disciplines involved (max. 300 words)

Deliverables

1. Scientific article

This project will be the first large independent replication attempt of Dijkstra et al. (1999). Furthermore, using meta-analysis we will statistically combine the replication results with the original results, allowing us to estimate the effects with the largest precision to date. The novelty of (1) having performed the first independent replication of Dijkstra et al. (1999) with more than twice the original sample size and (2) estimating with unprecedented precision effects that have direct implications for an important theory of bilingual word recognition will likely lead to a high impact publication. We aim to publish the results in *Journal of Memory and Language*, where Dijkstra et al. (1999) published the original study. In addition, we will make the acquired data set publicly available on the *Open Science*

Framework (<https://osf.io/>) website, allowing other researchers to use the data set (for instance for sample size calculations).

2. Replication as education

Second, we will develop the 'Replication as Education' manual described above, that can be used by staff within the BA linguistics (and also outside linguistics) to perform replication projects with BA students, for instance as a Bachelor thesis.

Enumerate intended project results: papers, research proposals or otherwise. (max 200 words)

Planning

Provide a breakdown of the project into phases with tentative timing (max 150 words)

1. *Preparatory stage (month 1).* Supervisors program the replication computer task, using the stimulus materials that are available in the appendix of Dijkstra et al. (1999). Trainees check whether the computer task exactly reproduces the original study.
2. *Data collection (month 2-4).* Trainees collect data, reaching 75 participants in about 3 months. Supervisors start writing the introduction and methods section of the article.
3. *Data analysis (month 5).* Trainees analyze the data under the supervision of the supervisors. The supervisors will perform a meta-analysis across the replication data and the original study.
4. *Finalization (month 6-7).* Supervisors finalize the article and the students review it.

Project timetable

	Tasks	Month						
		1	2	3	4	5	6	7
Trainees	Read literature							
	Check computer task							
	Data collection							
	Perform data analysis							
	Review the article							
Supervisors	Program computer task							
	Ethics clearance							
	Check data analysis							
	Perform meta-analysis							
	Write article							
	Write education manual							
	Supervise trainees							

Student Application

Students can apply by sending a motivation letter and resume to j.witteman@hum.leidenuniv.nl

Provide information on how to apply e.g. required documents for application (resume, motivation letter etc.) and an email address where student applications should be sent to.