

*Report on the thesis presented by Sofía González Castro: Flexibility of social categorization in bilinguals: The role of executive control and motivation. Jagiellonian University, Krakow, 2023*

*Granada, 11, November 2023*

Summary and overall evaluation:

The thesis includes a comprehensive introduction of the main questions and issues regarding the main topics of the thesis (bilingualism, social cognition, and social biases). This overview is followed by a summary of the studies and publications encompassing the empirical work on social categorization in bilinguals and the role of executive control and motivation on this process. The thesis includes five innovative studies, two of them already published in peer review journals. The thesis demonstrates a comprehensive understanding of the relevant literature on social biases, executive control, bilingualism, and social motivation. The written document reflects an excellent grasp of the theoretical and methodological, and statistical knowledge to conduct novel quality research in an independent manner. The discussion of the results, the theoretical and applied implications also indicate deep vision of the field and the potential for transfer to the society. The methodological rigor is also reflected in the identification and discussion of the limitations of the scientific approach and the limit of generalization with a proposal for improvement and new paths for future research. All these features make me recommend without hesitation that the doctoral thesis by Sofía González-Castro is approved. My believe is that the dissertation is ready for oral defense.

Novelty and relevance:

The thesis addresses a very relevant and innovative topic. The connection between bilingualism and control has been the subject of much research, however, the mediating role of bilingualism in social cognition and behavior has been much less investigated. The thesis focuses on bilingualism and social biases. The very few studies with children indicate that bilingualism is related with reduced social biases, but there was not research on adults and the mechanism underlying the effect are unknown. The thesis addresses this issue in a very novel, analytical, and systematic manner. The first study aims to illustrate the complexity of the bilingualism concept and demonstrate that even monolingual individuals differ in their levels of exposure to other languages so that they can be classified according to the level and type of exposure. The article, published in PLOS ONE is highly innovative, as very few studies have attempted to show linguistic variability among monolingual individuals concerning their exposure to other languages. The results of this first study are also instrumental in supporting the study of bilingualism as a continuous variable. Articles 1 to 4 address the main topic of the thesis and the overarching aim of providing a “framework to comprehend the pathway that connects bilingualism with the expression of social biases”. The four studies explore different aspects of this relationship with a focus on social biases, the relationship with bilingualism and the possible mediating role of executive control, and internal motivation (respond without prejudice). A very positive aspect of the studies reported in the dissertation is their interdisciplinary approach where findings and tools coming from social psychology, cognitive psychology and bilingualism research combine to address a novel question. Study 2 and 3 directly delved into examining the association between bilingualism and social biases. The overall results of the two studies (study 2 and 3) offer insights into the mediating role of cognitive and motivational

factors in the correlations between bilingualism and social biases. In both studies, the motivation to respond without prejudice emerge as a critical mediating variable between bilingualism and social bias. In study 3 where bilingualism was considered a continuous variable and bilingual experience as an important dimension within this continuous, bilingual experience and multiculturalism (Experiment 3) was identified as the specific bilingual dimension impacting social biases. Study 4 and 5 take an experimental approach to further examine the role of flexibility and cognitive control on the relation between bilingualism and biases, and the interaction with the processing goals (Experiment 5). Study 4 revealed that bilingual individuals with higher language-use experience scores exhibited reduced conflict driven by stereotypical characteristics of stimuli. In addition, they showed reduced effects of changes between congruent and incongruent stimuli, indicating increased flexibility in participants with larger scores in the language. experience dimension also contributes to reduce social biases. A puzzling result of this study is that internal motivation did not have the mediating role found in the previous studies. The last article (published in a Polish Journal) explores the hypothesis that differences in the pattern of results between studies may be due to differences in task goals. The argument is that in study 4, the instructions to be fast (and accurate) may have modulated the role of motivation. In this direction, the last two studies reported in the dissertation takes an interesting approach and manipulate the task processing goals (processing speed vs accuracy) to explore the possible influence of this factor on flexibility. The results of two experiments manipulating task goals (speed vs accuracy) in a mixed or in a blocked manner (Experiment 2) indicated that the processing goals also modulate the flexibility of social categorization so that frequent changes in goal reduce flexibility. This is a very interesting results, although it is only conducted with monolingual participants,

so the connection between these patterns of results and that of the previous studies is far reached.

Overall, the analytic approach of the thesis provides an overall framework on the relation between bilingual language use and social categorization and biases. This framework includes internal motivation, executive control and flexibility as important factors underlying the role of bilingualism in social cognition. In this sense, the data reported in the thesis raise new questions and new paths to examine the underlying mechanisms between the observed relation between bilingualism and social cognition (social biases).

### Scientific approach

*Capturing the diversity of bilingualism:* Recent theoretical and empirical approaches to bilingualism claim that bilingualism is a multifaceted phenomenon that must be approached facing its complex nature. Classifying participants as either bilingual or monolingual does not delve into the complexity of the bilingual experience and the consequences in terms of processing. Thus, studies comparing bilinguals and monolinguals as two different monolithic categories have not consistently aligned to unveil the imprint of bilingualism on our brain and behavior, reflecting the difficulty of understanding the consequences of bilingualism when context of language use and experience are not considered. Recent research has emphasized the importance of exploring the heterogeneity of the bilingual experience instead of solely focusing on the bilingual/monolingual dichotomy.

The dissertation very thoroughly discusses the important role of defining and measuring the complexities of the linguistic experience of monolinguals and bilinguals. Across studies, bilingualism is defined categorically and as a continuous. The effort to also

measure the bilingual experience (exposure to other languages) of monolinguals is very novel and provides empirical support to the approach in studies 3-4 to consider bilingualism as a continuous variable. In addition, the bilingual experience is approached by considering multiple factors and using measures directed to measure these factors. The statistical approach is also multifaceted reducing data and extracting the important dimensions defining bilingualism. Looking at bilingualism as a categorical and continuous variable and considering different dimensions of the bilingual experience ensures a comprehensive examination of the influence of bilingualism on social cognition.

*Open sciences and replicability.* The methodological approach follows many of the principles for open science and replicability. The series of studies reported in the thesis include large sample, measurement of the variables with different procedures and approaches (questionnaires vs experiments) that permit triangulation. The relation of bilingualism and social biases is replicated across three experiments using large sample. The statistical approach is sophisticated and reflect the expertise of the PhD candidate to address questions with the proper methodological tools. A very positive aspect is that some these studies are preregistered and the data, and the script for analysis are openly accessible.

### Conclusion

The dissertation demonstrates an excellent command of the topic under research, and the ability of the PhD candidate for conducting innovative research. The discussion of results, along with the exploration of theoretical and practical implications provides a framework where the relation between bilingualism and social cognition can be understood and further explored. The dissertation also exhibits methodological rigor and the engagement of a scientific approach that enhances replicability and embraces the principles for open

science. With confidence, I recommend the approval of Sofia González-Castro's doctoral thesis for oral defense.

*Teresa Bajo*

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BAJO MOLINA  
MARIA TERESA -  
26444588Q  
Fecha: 2023.11.11  
11:51:13 +01'00'

Campus de Cartuja, s/n  
18071 Granada, Spain  
[mbajo@ugr.es](mailto:mbajo@ugr.es)

Dra. Teresa Bajo, Full Professor  
Department of Experimental Psychology  
Research Center for Mind, Brain and Behavior (CIMCYC)  
University of Granada