UNIVERSITÀ
DEGLI STUDI
DI PADOVA

Head Office: Università degli Studi di Padova

Dipartimento di Psicologia dello Sviluppo e della Socializzazione (DPSS)

Ph.D. COURSE IN: PSYCHOLOGICAL SCIENCES

SERIES: XXXV

The power of language in social categorization: cognitive consequences

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Content

Abstract

English

Language is action, the joint action that emerges when speakers and listeners perform their actions in coordination, as ensembles. After all, human language has evolved to support social and interpersonal interactions. The present dissertation aims to highlight the importance of considering both the speaker's and the listener's perspectives at the same time because interaction and communication necessitate taking into account both parties simultaneously. Specifically, the present thesis aims to investigate whether individuals categorize others according to the language they speak, and what is the cognitive impact of this categorization. The connections between social categorization, the role of language in this phenomenon, and the potential implications of social categorization based on language provide the basis for this thesis. In doing so, in the first empirical chapter of the present thesis, we investigated the power of language as a cue for social categorization, testing bilingual communities. The results showed that bilinguals categorize individuals belonging to the same sociolinguistic community based on the language these individuals speak, suggesting that social categorization based on language is an implicit and automatic process. The second objective of this thesis refers to the cognitive and linguistic consequences of implicit categorization based on language. In doing so, in Chapter 3 of this thesis, we investigated whether a phenomenon of social attention (the gaze-cueing effect) is affected by the linguistic identity of the individual. The results indicate

that categorization based on language is a variable able to shape the gaze-cueing effect, suggesting that social attention is sensitive to the language of our interlocutors. Taking a step further, in Chapter 4 we focused on message interpretation, examining how the same message can be evaluated differently depending on the linguistic identity of our interlocutor. The results show that the categorization of the speaker based on his/her language has an impact on sentence evaluation, suggesting that message interpretation cannot be dissociated from who is communicating the message. Taken together, the results of the present thesis suggest that the categorization based on language: i) is an implicit and automatic phenomenon that occurs even when language does not discriminate between social groups; ii) shapes social attention, and iii) affects the interpretation of the message.

Italian

Il linguaggio è azione, l'azione congiunta che emerge quando parlanti e ascoltatori compiono le loro azioni in coordinazione, come un'insieme. Dopotutto, il linguaggio umano si è evoluto per supportare le interazioni sociali e interpersonali. La presente tesi mira a sottolineare l'importanza di considerare contemporaneamente sia la prospettiva di chi parla che quella di chi ascolta, perché la comunicazione richiede di tenere conto di entrambe le parti contemporaneamente. In particolare, la presente tesi si propone di indagare se gli individui classificano gli altri in base alla lingua che parlano e qual è l'impatto cognitivo di questa categorizzazione. Le connessioni tra la categorizzazione sociale, il ruolo del linguaggio in questo fenomeno e le potenziali implicazioni della categorizzazione sociale basata sul linguaggio forniscono la base di questa tesi. In tal modo, nel primo capitolo empirico della presente tesi, abbiamo indagato il potere del linguaggio come spunto per la categorizzazione

sociale, testando le comunità bilingui. I risultati hanno mostrato che i bilingui classificano gli individui appartenenti alla stessa comunità sociolinguistica in base alla lingua che questi individui parlano, suggerendo che la categorizzazione sociale basata sulla lingua è un processo implicito e automatico. Il secondo obiettivo di questa tesi si riferisce alle conseguenze cognitive e linguistiche della categorizzazione implicita basata sul linguaggio. In tal modo, nel capitolo 3 di questa tesi, abbiamo indagato se un fenomeno dell'attenzione sociale (l'effetto *gaze-cueing*) è influenzato dall'identità linguistica dell'individuo. I risultati indicano che la categorizzazione basata sul linguaggio è una variabile in grado di plasmare l'effetto di *gaze-cueing*, suggerendo che l'attenzione sociale è sensibile al linguaggio dei nostri interlocutori. Facendo un ulteriore passo avanti, nel capitolo 4 ci siamo concentrati sull'interpretazione del messaggio, esaminando come lo stesso messaggio possa essere valutato diversamente a seconda dell'identità linguistica del nostro interlocutore. I risultati mostrano che la categorizzazione del parlante in base alla sua lingua ha un impatto sulla valutazione della frase, suggerendo che l'interpretazione del messaggio non può essere dissociata da chi sta comunicando il messaggio. Nel loro insieme, i risultati della presente tesi suggeriscono che la categorizzazione basata sul linguaggio: i) è un fenomeno implicito e automatico che si verifica anche quando il linguaggio non discrimina tra gruppi sociali; ii) modella l'attenzione sociale e iii) influenza l'interpretazione del messaggio.

Preface

Language is one of the most fundamental abilities that humans have. If we consider the capacity we possess to express our thoughts during daily social interactions, we can realize how astonishing the act of communication can be. When we speak to another person, it is enough to have the purpose of the conversation in mind (i.e., the message we want to transmit to the person we are addressing), and all the words come to mind fluidly and without hesitation. Thanks to language, every day we can be involved in one of the core features of human life: social interactions. Many of our daily affairs provide numerous opportunities for social interactions.

According to Clark (1996), language use is a form of *joint action*. A *joint action* is carried out through a group of people acting in coordination with each other. Interestingly, the term *joint action* does not refer to the sum of a speaker speaking and a listener listening. It is the joint action that emerges when speakers and listeners perform their actions in coordination, as a whole. Therefore, language use incorporates both individual and social processes. In this sense, it is easy to infer the idea that language (or conversation) operates only when 'immersed' in a social context. After all, human language has evolved to support social and interpersonal interactions. Indeed, in addition to transmitting literal meaning, a person's speech conveys nuanced information about his/her social identity, including evidence about his/her geographic origin, social relationships, and position in a broader social network. How the linguistic identity of the speaker is conveyed, and which are the consequences for the listener are the two main topics of this thesis.

People use language to coordinate actions, transfer experience, regulate social status, and strengthen relationships, as well as to manipulate, intimidate, seduce, and deceive.

Disciplines in social sciences, ranging from psycholinguistics and sociolinguistics to anthropology and education, have shown the social significance of language using a variety of measures and disciplinary approaches. The role of language in human conflict is neither new nor outdated. For instance, historical analyses provide multiple examples of linguistic differences acting as precursors of human conflict. Shell (2001) showed how linguistic differences lead to social conflicts and intolerance with different examples. For example, in US history, the tongues of slaves who spoke no English were severed, Russian speakers were executed following the Alaska purchase, and speaking German in public was forbidden during World War II. Together, those episodes refer to the impact of language on human conflict and social group stratification.

Furthermore, social groups are an unavoidable feature of human life. Given this importance, psychologists have spent much time studying social group membership, trying to understand why people feel that they belong to some groups but not to others, and why they denigrate people whom they perceive as belonging to other groups, that is, people they perceive as *other*. However, something is missing from the study of social grouping; researchers largely overlook a key factor: language. In modern-day societies, sociolinguists report that the language someone speaks acts as a key indicator of their group membership. In her book, Katherine Kinzler (2021) wrote: *"Where we belong, with whom we connect, with whom we love, and whom we hate: almost every aspect of social life is shaped by the way we speak. This is true in personal relationships: babies choose to approach people who talk in certain ways, and employers hire those whose spoken language fits their expectations. The way we speak plays a fundamental role in cultural and national life"* (page X).

The present thesis aims to investigate whether individuals categorize others according to the language they speak, and what is the cognitive impact of this categorization. In particular, the connections between social categorization, the role of language in this phenomenon, and

the potential implications of social categorization based on language provide the basis for this thesis. In this regard, in the first empirical chapter of the present thesis (Chapter 2), it is investigated whether language can be considered a cue for social categorization. Empirical findings suggest that this is the case, as language is used as a marker of social categories from the first years of life and continues to function as such through childhood to adulthood. Within the framework of previous studies, the focus has been on bilingual communities. In this context, social categorization based on language is not mandatory because the individual is embedded in a community where more than one language is used. In other words, people living in a bilingual community are regularly exposed to both single and dual-language interaction contexts and, therefore, they may not categorize individuals according to the language they speak. Therefore, Chapter 2 explores whether language is an automatic cue of social categorization in a bilingual context.

The second objective of this thesis refers to the cognitive and linguistic consequences of implicit categorization based on language. In this respect, first, the consequences of social attention (a central ability that allows individuals to create meaningful social relationships) are investigated. In particular, as a phenomenon of social attention, the gaze-cueing effect has been exploited. This effect constitutes a human tendency to shift attention in response to the averted gaze of a face they are fixating on. In Chapter 3, it is explored whether the gaze-cueing effect is affected by the linguistic identity of the individual. Taking a step further, in Chapter 4 the focus is on linguistic aspects, examining how the same message can be evaluated differently depending on the linguistic identity of the interlocutor. Finally, in Chapter 5 it is provided some conclusive remarks and suggestions for future avenues of the research.

In total, it has been tested about 800 participants. Contrary to what was assumed at the beginning of this project, data collection took place online in all studies, due to the pandemic. To empirically test the quality of data collected on the Internet, it has been used well-known

paradigms in the cognitive literature (i.e., memory confusion paradigm, gaze-cueing paradigm). This allowed the results obtained online to be compared to those found in the literature, which confirmed the validity of the results.

Chapter 1 | General Introduction

Categorization is a fundamental cognitive process whose function is to organize, structure, and process stimuli in our environment in rapid and efficient ways. Once perceptual rules for establishing category membership are acquired, generic knowledge derived from prior interactions with category members can provide a rich source of inferences about the properties of newly encountered individuals (Bodenhausen et al., 2012). Through categorization, the amount of information that the brain processes is reduced by clustering stimuli into groups based on a common characteristic (see, e.g., Ellemers & Haslam, 2012; Tajfel, 1982). Since categorizing individuals into social groups recruits fewer cognitive resources than perceiving individuals as discrete entities, more of the limited resources of the brain remain available and can be assigned to other cognitive tasks (Macrae et al., 1994). In other words, with the help of categories, the mind transforms the world from chaotic complexity to predictable order.

Social categories are no different from other types of concepts in their capacity to serve these basic knowledge functions. Social categorization is an automatic phenomenon that occurs when we meet a new person and can influence the way we perceive people from different groups (Bartlett, 1932; Kawakami et al., 2017). Whether based on social roles or other social cues, identifying an individual as belonging to a particular social category enables inferences about a range of relevant and important issues. We can infer, for example, what the person's goals and intentions could be and what general personality traits are likely to characterize him/her. In doing so, we can behave and interact with people from those groups in appropriate ways. However, social categorization differs from other types of categorizations in one crucial way: people tend to place themselves in a category (Bodenhausen et al., 2012), guiding them to be partial to members of their group (ingroup) relative to those from other groups (outgroup)

in terms of social preferences, empathic responding, and resource distribution (Allport, 1954; Harris & Fiske, 2006; Tajfel et al., 1971; Xu et al., 2009).

Over the past few decades, social psychologists have extensively explored the dynamics of social categorization. It has been claimed, with significant empirical support, that encountering a new individual activates three 'primitive' or 'primary' dimensions: race, gender, and age, which the mind encodes automatically (that is, across all social contexts and with equal power; Hamilton et al., 1994). Interestingly, these dimensions can be encoded without other individual information. For example, a person might remember that their new neighbour is a young black man, without remembering anything else about him. In this sense, race, gender, and age play a key role in social categorization.

An example of categorization based on one of these three features can be the own-race bias (ORB), that is, the tendency to have a better recognition memory for faces of one's own race than for faces of other, less familiar races. The ORB is of particular interest because it is very common, and it has been considered to reflect implicit and automatic categorization. Nevertheless, at the same time, it has been shown that the ORB is modulated by the visual experience, sociocultural experience, and expertise for own-race. For instance, new-borns show no racial preferences (Kelly et al., 2005), but by the age of 3 months, infants with experience primarily with own-race individuals prefer to look at the faces of their race than the faces of another one (Bar-Haim, Ziv, Lamy, & Hodes, 2006; Kelly, Liu, et al., 2007; Kelly et al., 2005). However, 3-month-olds who engaged with individuals from their race as well as those from another race show no visual preference for faces belonging to either group (Bar-Haim et al., 2006). Therefore, the familiar race class in the environment shapes an early visual preference for a race class. In addition to the ORB, the own-gender bias in face recognition traditionally is defined as better memory for faces of one's gender (Sporer, 2001). In the same vein, there is an own-age bias, suggesting that it is easier to recognize and remember faces

belonging to persons within their own age range (e.g., Rhodes & Anastasi, 2012; Wiese et al., 2013).

Although category formation has many upsides, much of the research on social categorization focuses on its potential downstream negative consequences. Classification into social groups has critical consequences because it facilitates the activation of stereotypes and prejudice. Indeed, prejudice was assumed to be an inevitable consequence of social categorization (Allport, 1954). The prevailing definitions of prejudice in today's research still stem from Allport (1954): "*Thinking ill of others without sufficient warrant. This crisp phrasing contains the two essential ingredients of all definitions-reference to unfounded judgment and to a feeling tone*" (Page 6). For example, people are prejudiced against those outside their group (e.g., Aboud, 1988; Allport, 1954; Baron & Banaji, 2006; Bigler & Liben, 2006; Jacoby-Senghor et al., 2015), which can lead to the dehumanization of extreme outgroups (e.g., Harris & Fiske, 2018). In other words, once a person has been assigned to a particular social category, relevant stereotypes are most probable to be automatically activated (for a review, see Macrae & Bodenhausen, 2000). Some of the most invidious effects of social categories result from the biased belief systems that social categorization supports, including stereotypes for, essentialist beliefs about, and even dehumanization of members of some social groups (Harris & Fiske, 2018; Neuberg & Descioli, 2015; Tajfel et al., 1971).

The role of language in social categorization

In this dissertation, the focus is on a cue that has received less attention: the linguistic identity of the interlocutor. The linguistic identity of the interlocutor is considered a less salient cue with respect to race, gender, and age because it remains unknown until the person starts speaking. Although people may be able to guess which language is spoken by the interlocutor

based on the sociolinguistic contexts they live in, for instance, which language is more frequently used in that context, these guesses can be incorrect. Thus, the language of the interlocutor will only be known (and the guesses confirmed or disconfirmed) when the interlocutor is speaking. Nevertheless, why has language been less considered? A fundamental characteristic of person perception and categorization is that people react to the first available and meaningful information to categorize others (Fiske & Neuberg, 1990). Features that are perceived as less salient (such as language) are also less plausible to be used in impression formation or categorization. In this sense, *salience* would be the reason for the lack of studies on the role of language as a cue for social categorization.

However, as mentioned at the beginning of this dissertation, language is a fundamental human trait and therefore merits exploration concerning its role in categorization. In 1987, the Ethnolinguistic Identity Theory (Giles, Bourhis, & Taylor, 1977; Giles & Coupland, 1991; Giles & Johnson, 1981, 1987) indicated the importance of language for the ethnic categorization of self and others. That is, this theory states that language is one of the most, if not the most important aspect of social categorization of self and others. In the same vein, studies in the literature have suggested that the way one speaks determines how that person is perceived. For instance, just listening to the way people say the word "Hello" is enough to assess various personality traits of the speaker, such as attractiveness, aggressiveness, and confidence (McAleer et al., 2014). In other words, these evaluations serve to build rapid impressions about our interlocutor and consequently trigger approach or avoidance behaviours.

Studies in the literature confirm that categorization based on language emerges from the early years of life, suggesting that language is a powerful *ingroup/outgroup* cue, regardless of social connotations. That is, infants have been shown to use language to encode individuals in different groups according to the language they speak. For example, new-borns can distinguish their monolingual mother's language from another rhythmically dissimilar

language (Bosch & Sebastián-Gallés, 1997; Moon et al., 1993). Furthermore, Kinzler, Dupoux, and Spelke (2007) observed that 6-month-old babies prefer to look at speakers of their native language than those who speak a different language. Similarly, other studies reported that 11- and 19-month-old babies, when learning new information, look more frequently at members belonging to the same linguistic group than at people of a different linguistic group (Begus et al., 2016; Howard et al., 2014; Liberman et al., 2017).

At the same time, an important cue that may influence the personal impressions of interlocutors is the accent when they speak (Cargile & Giles, 1997; Cargile, Giles, Ryan, & Bradac, 1994; Ryan, 1983). Accent represents one's manner of pronunciation and, critical for the main aim of the present thesis, it constitutes an important part of a speaker's social identity and conveys a considerable amount of social information (Giles, 1970; Edwards, 1999; Giles & Johnson, 1987; Lippi-Green, 1997). To this respect, it has been shown that children's privileged attention to accent over race continues throughout early childhood. At 5 years of age, children's social judgments reflect preferences for both individuals of their race and native-accented individuals, when each category is tested in isolation (see, e.g., Aboud, 1988; Kinzler et al., 2009). However, when the accent is compared to race so that someone of the child's race speaks with a foreign accent and someone of a different race speaks with the child's native accent, white children choose to be friends with other people of native-accented race individuals (Kinzler et al., 2009). Interestingly, the categorization of language speakers by children affects their application of prosocial behaviours at different developmental stages. For example, five-year-olds require significantly more prompts and cues to help foreign language speakers (i.e., individuals that speak with a foreign non-standard accent) with respect to native language speakers (Somogyi et al., 2020). Children view language spoken as relatively more stable throughout life, compared to other markers of social categories (such as race). Together, these amounts of research supply evidence that attention to the way others speak provides a

critical, and potentially primary, tool on how children divide the social world. From an evolutionary perspective, accent marks outgroup membership, and such foreignness may be seen as dangerous on fronts that are not necessarily social. Psychologists point to the evolutionary origins and validity of having language (or accent) as a dedicated dimension of social categorization, suggesting a cognitive system dedicated to differentiating language from non-language and one language from another. It has been proposed that vocal cues serve as a reliable indication of coalitions present much earlier than visual cues to race emerged on an evolutionary time scale (Kinzler et al., 2007; Pietraszewski et al., 2014a, 2014b). Social inferences made by children and adults must, at least in part, reflect cultural learning, including experiences of hearing diverse languages and exposure to other people's beliefs about foreign languages or accented speakers. Indeed, many reported language-based social attitudes to reflect knowledge of linguistic stereotypes (e.g., Day, 1980; Giles & Billings, 2004; Kinzler & DeJesus, 2013a). Based on all these findings, researchers have argued that the "big three" social categories are incomplete, and that language could be considered the fourth dimension in social categorization.

In addition to research with infants, which forms the basis for exploring the role of language as an implicit and automatic cue for social categorization, the foundations in research with adults have been laid in recent years. That is, increasing empirical evidence is accumulating for the role of language in the categorization of faces (see Chapter 2 for details of the studies). Adults have been shown to use language as a cue for social categorization. Interestingly, this categorization seems to be robust and stable in the adult population, and it even remains when an observer is given alternative social information that might guide categorization and, in fact, reduces categorization by race but not by language (Pietraszewski & Schwartz 2014b). Empirical investigations on the role of language as a cue for categorization in adults are those of Pietraszewski and Schwartz (2014) and Baus, Ruiz-Tada, Escera & Costa

(2021). In both studies, the authors showed that people group individuals (that is, faces) according to the language (or accent) they speak. However, one common feature of the studies conducted so far refers to the fact that the accents or languages used in the studies belonged to two different sociolinguistic contexts, where one was the participant's language (or accent) and the other was a foreign language. In particular, the participants in Pietraszewski and Schwartz's studies were American citizens of California who were tested with different English accents, including American, British, or Irish. Similarly, in the study by Baus and colleagues, participants were Spanish dominant, had English as a foreign language, and belonged to a sociolinguistic community where Spanish is an official language while English is not. Therefore, we wondered whether it is possible that participants not only categorize faces according to the accent or the language they speak but also categorize faces mediated by the different sociolinguistic communities to which these faces could be ascribed. It is known that a foreign accent generates an immediate classification of the speaker as an out-group member and that this classification activates the stereotypes and stigmas associated with this group (Ryan, 1983; Nguyen, 1993; Wated & Sanchez, 2006). Therefore, participants could classify speakers according to the accent or language they speak and/or the associated stereotypes. The main aim of the first part of this dissertation is to explore whether language categorization is an automatic phenomenon that occurs even when the languages associated with the stimuli (i.e., faces) cannot be ascribed to different social communities, as in bilingual communities. That is, people living in a bilingual community are regularly exposed to both single- and dual-language interaction contexts. Moreover, in bilingual communities, the two languages belong to the same socio-linguistic context, and this means that the two languages do not distinguish between different social groups. More critical for our purposes, an individual in this community may be associated with the two languages used in the community rather than with a single language. That is, unlike what normally occurs in monolingual communities where there may

be a one-to-one correspondence between an interlocutor and a language, in bilingual communities there may be a one-to-two correspondence. In sum, the first main aim of the present thesis is to investigate whether social categorisation based on language also occurs in bilingual communities. This topic will be investigated in Chapter 2.

In the remainder of this Chapter, the focus is on which are the cognitive consequences of such a categorization based on language. Unlike what was done in Chapter 2, in which bilingual communities were tested, in Chapters 3 and 4, the cognitive consequences were investigated by analysing Italian monolingual participants. The theoretical research question is whether categorizing others based on the language they speak can influence two important aspects of our daily interactions: social attention and message interpretation.

First, we focus on social attention, an area of study that investigates attentional behaviours in social environments. Social attention is often understood to reflect changes in attentional behaviour that occur in response to information conveyed by other people. To address the first theoretical research question, we investigated to what extent the linguistic identity of our interlocutor affects where we orient our attention. Second, we focused on message intepretation. In particular, we investigated whether the comprehension of the same message depends on our interlocutor's linguistic identity.

From a theoretical point of view, these two research questions are correlated: it is possible to hypothesize that the comprehension of a linguistic message can be determined by the attention it attracts of our interlocutor. In the remainder of this Chapter, these two questions are introduced.

Language categorization and social attention

According to the studies mentioned above, people automatically categorize their interlocutors according to the language they speak. Does such a categorization play a role in shaping social attention? This theoretical research question drives this section. Individuals tend to orient their own attentional resources towards the same spatial location indicated by others (e.g., Emery, 2000). This phenomenon, known as social attention, is a central ability, as it allows individuals to create meaningful social relationships and efficiently share attention toward a specific object or event occurring in the environment (e.g., Capozzi & Ristic, 2018). An increasing number of studies have shown that social attention can be effectively guided by eye-gaze direction, which provides a clear and easily accessible source of information about where another individual is attending (see, e.g., Frischen et al., 2006; McKay et al., 2021; Shepherd, 2010; for reviews). The direction of gaze in the eye often conveys social affordance. For example, reciprocating someone's gaze may signal social interest, creating an opportunity for interaction. In contrast, looking away may signal an absence of social interest, ending an opportunity for interaction. In everyday life, engagement and orientation dynamically often are combined (Jording et al., 2018), as evidenced, for example, by infant social reference behaviors alternating between objects and mother-directed gaze (Feinman et al., 1992) or those demonstrated by adult partner-object gaze coordination during conversations. This ability is considered to also play a crucial role in several cognitive domains. For instance, recent developmental studies have shown that increased sensitivity to gaze contact is evident at a remarkably early age (see Senju & Johnson, 2009 for a review). The early sensitivity to gaze cues in newborns contrasts with the developmental deficits in certain aspects of gaze processing observed in individuals with autism spectrum conditions (ASC). Although individuals with ASC show relatively unimpaired discrimination of the gaze direction of others, they demonstrate an impaired ability to infer the mental states of others (e.g., intentions) from their

gaze (see also Baron-Cohen, 1995; 1997). Unusual attentional responses to direct gaze have been found in other clinical populations, such as, for example, in individuals with obsessive-compulsive disorder (OCD; Dalmaso et al., 2022).

A large body of experimental evidence indicated that eye-gaze stimuli lead to remarkable effects that can be classified into three distinct phenomena — namely, (a) attention holding, (b) attention capture, and (c) attention shifting. Both attention holding and attention capture are typically reported in the presence of direct-gaze stimuli, which are powerful social signals generally associated with approaching behaviors (see Emery, 2000). In more detail, attention holding refers to the greater "difficulty" to disengage attention from direct gaze faces as compared to both averted-gaze or closed-eye faces. Similarly, attention capture refers to the tendency shown by direct-gaze stimuli, as compared with averted-gaze stimuli, in grabbing the attentional focus when presented in the periphery — that is, while the participant is looking elsewhere (typically, at fixation). Finally, attention shifting refers to the tendency to shift attention towards the spatial location indicated by a task irrelevant face with an averted gaze presented at fixation, a phenomenon known as the "gaze-cueing effect" (GCE), which has been investigated mainly through manual response tasks relying on covert orienting. In a typical gaze-cueing task, researchers manipulate gaze direction signals in a laboratory procedure and measure the resultant gaze-following behavior. To date, the gaze-cueing task remains one of the most used experimental paradigms for studying social attention. In this thesis, attentional shifting has been chosen (i.e., gaze-cueing task) to explore the interaction between social attention and language categorization.

Early studies considered the gaze-cueing effect as an automatic phenomenon, as it occurs even when the observer is not motivated to shift attention towards the direction of gaze cues, such as when they are counter-informative (i.e., targets are more likely to appear in the

opposite side as that indicated by the gaze; see, e.g., Driver et al., 1999). However, it has recently been demonstrated that social variables are capable of modulating the gaze-cueing effect. As mentioned in the first part of this introduction, we constantly interact with — or are exposed to — different people who may come from the same or different social environments as ours and with the same or different social characteristics as ourselves. Information about race, age, and gender are automatically and rapidly extracted when we look at a face of a person, which contributes to social categorization (Quinn et al., 2002; Weisman et al., 2015). Studies in the literature have explored whether such social information that is extracted automatically from a face stimulus can shape the gaze-cueing effect. Recent evidence indicates that this is the case. For example, a larger gaze-cueing effect has been reported for familiar faces over unfamiliar faces (e.g., Deaner et al., 2007), for trustworthy faces over untrustworthy faces (e.g., Sußenbach and Schonbrodt 2014), and for faces described as belonging to high-status individuals rather than low-status individuals (e.g., Dalmaso et al., 2012; 2014). Together, all these findings seem to confirm the important role of social factors in shaping gaze-mediated orienting of attention (for a recent review, see Dalmaso, Castelli & Galfano, 2020). While there is a large amount of studies exploring whether different social dimensions can influence our attention, no studies have explored the role of language. This is the main aim of Chapter 3.

In particular, the purpose of Chapter 3 is to investigate the role of language (as a cue for social categorization) in shaping social attention, by exploring whether the gaze-cueing effect is modulated by the linguistic identity associated with facial stimuli. To do that, the standard gaze-cueing paradigm has been used. Moreover, the linguistic identity of the cueing faces has been manipulated through a preliminary familiarization phase. Participants were familiarized with native (Italian) and unknown languages (Albanian and Basque). In the next

section, the focus is on whether categorization based on language affects message interpretation.

Language categorization and message interpretation

The identity of the interlocutor is an essential cue for successful communication to take place. Studies in the literature have shown that people interpret a message differently depending on who is providing this message. For instance, a sentence like "I have a large tattoo on my back" could be considered a credible statement if made by an adult but ironic if made by a child. Event-related potential (ERP) evidence seems to confirm that this pragmatic information is available to listeners when they comprehend language. Specifically, hearing a child say a phrase like “I just quit smoking” or a man say “I am pregnant” induces an ERP component that indicates surprise, suggesting that listeners are considering the plausibility of an utterance given inferences they have made about the speaker during sentence comprehension (Van Berkum et al., 2008). In other words, addresses use the knowledge of other people to make sense of what they say (Nieuwland et al., 2010). That is, as argue by pragmatics, the content of what is said (the message) is inextricably intertwined with who is saying it (the speaker). Pragmatics is the study of communication, the study of how language is used; it assumes a division between knowledge of the language and the way it is used. The goal of pragmatics is to provide a set of principles, which regulate how knowledge of the language and general reasoning interact in the process of language understanding, to give rise to the different kinds of effects that can be achieved in communication. Pragmatic aspects of meaning go beyond the semantic, literal meaning of a sentence and include contextual inferences that hearers compute as part of what the speaker intended to convey. Moreover, pragmatic aspects of meaning are driven by expectations about how rational communication works. The starting point for studies in pragmatics is the mismatch between what words mean,

which is encoded in the rules of the language, and what speakers mean by using them, which may vary greatly from the literal meaning of the linguistic units used. Scientific research has become interested in the importance of the social context for an effective understanding of the message. In particular, linguistic research suggests that the computation of a context-free sentence meaning is highly problematic, and that linguistic meaning is always coloured by the pragmatics of the communicative exchange (Kempson, 2001; Perry, 1997; Clark, 1996). That is, the role of context and the identity of our interlocutor are of paramount importance in order to understand the message appropriately. In other words, the message cannot be disassociated from who is communicating the message. In the present thesis, a similar question concerning the linguistic identity of our interlocutor is addressed. Do we interpret a message differently according to the linguistic identity of the speaker, if all the other pragmatic information is identical? The answer to this question provides the main topic of Chapter 4.

Empirical investigations in adults have tried to answer this question by comparing different interlocutors that vary in accent. For example, Lev-Ari and Keysar (2010) showed that adult English native listeners remember trivia statements about facts of world knowledge, mostly unknown to participants (e.g., 'A giraffe can go without water longer than a camel can') less accurately (Lev-Ari & Keysar, 2012) and evaluate them as less credible (Lev-Ari & Keysar, 2010; Hanzlková & Skarnitzl, 2017) when produced with a foreign-accent than when they are produced with a native-accent speaker. Lev-Ari & Keysar interpreted their findings based on a 'fluency-intellegibility' account, which involves the ease or difficulty with which listeners can process a person's speech. A critical point was that this effect could not be attributed to stereotypes against foreigners because the participants had explicitly been told that the speakers were reciting statements provided by the experimenter. In addition, this effect disappeared for speakers with a mild accent. The idea behind the 'fluency-intellegibility' account is that, since foreign-accented speech diverges from the standard accent, it would be

harder to understand and it would be perceived as less fluent; this in turn would negatively affect the credibility of a statement uttered with foreign-accent speaker (Dragojevic et al., 2017; Oppenheimer, 2008; Schwarz, 2004). This is consistent with the idea that processing fluency, or the ease or difficulty in processing information in general, affects cognitive processes and influences judgments (Alter & Oppenheimer, 2009). In other words, the easier it is to process, the easier it is to remember, and the more credible a message is considered (Lev-Ari & Keysar, 2010, 2012; Reber & Schwarz, 1999). In agreement with this, the 'cognitive account' suggested that the negative consequences of 'sounding stranger' (with a non-standard accent) roots in a basic cognitive mechanism related to information processing (see Formanowicz & Suitner, 2020). A nonstandard voice is less frequent and, therefore, is less familiar. This lack of familiarity may, on the one hand, cause less liking and, on the other hand, make the processing of speech more effortful, thus contributing to the conversation experience (Van Engen & Peelle, 2014). This disruption is unpleasant, and the negative effect transfers to the negative evaluation of the speakers (Bent & Bradlow, 2003; Clarke & Garrett, 2004; Dragojevic, 2019; Munro & Derwing, 1995; Schmid & Yeni-Komshian, 1999). Indeed, if processing fluency was reduced and/or cognitive resources were highly demanded, this could generate a negative effect. In contrast, if speech information were easily decoded and/or if people got better at decoding the information either could generate a positive effect. As a result, this positive/negative effect triggered by processing fluency would determine how a speaker is perceived.

However, the origin of this bias is not clear. First, the results have not always been consistent. For example, Souza and Markman (2013) failed to find an effect of foreign accent on trust using the same paradigm as Lev-Ari and Keysar (see also Stocker, 2017; Wetzlel et al., 2021; Frances et al., 2018). In addition, when we hear a foreign speaker, not only have we more difficulties understanding the message due to fluency costs, but we also categorize our

interlocutors as a foreigner. Previous studies suggest that language (or accent) generates an immediate classification of a speaker as an ingroup or outgroup member (Berger et al., 1980; Ryan, 1983). In other words, an accent can, in some cases, signal one's ethnic/national or other group identities, and thus trigger *us/them* distinction (Formanowicz & Suitner, 2020). Indeed, prosodic variations are deeply grounded in intergroup social phenomena, as first advanced in ethnolinguistic identity theory (Giles & Johnson, 1987) and further developed in the communication accommodation theory (Giles, 2016). In particular, belonging to the accented group usually elicits a negative evaluation from listeners belonging to the linguistically normative group (Calamai & Ardolino, 2020). This is of critical relevance because it has been suggested that categorization based on accent can activate stereotypes/prejudices. In particular, it has been shown that people who speak with a foreign accent are usually judged as less trustworthy, less educated, less intelligent, or less competent than native speakers (Dewaele & McCloskey, 2015; Fraser & Kelly, 2012; Fuertes, Gottdiener, Martin, Gilbert, & Giles, 2012; Giles & Watson, 2013; Gluszek & Dovidio, 2010; Lev-Ari & Keysar, 2010; Lippi-Green, 1997). Relatedly, the social identity approach regards the association of one's social category with a positive identity and encourages distinctiveness from outgroups (Tajfel & Turner, 1979). In line with this theoretical account, the categorization generated by vocal cues carries on the need to consider the ingroup distinctly and positively and consequently devalue the members of the outgroup. Other studies investigating the impact of accents on people's behaviour have suggested that people categorize others according to the language or accent they speak. That is, an accent serves as a cue that a speaker is a non-native speaker, which activates stereotypes associated with foreign groups and this in turn affects the trustworthiness of the message (Giles, 2013; Ryan, 1983; Stevenage et al., 2012; for evidence with children, see Kinzler & DeJesus, 2013). In this sense, foreign-accent speech may not only affect the message's intelligibility but may also lead to an implicit categorization of the speaker as an outgroup individual in terms of

cultural and social heritage. However, to what extent social categorization or processing fluency contributes to bias toward accented speakers is unclear (see for a discussion Foucart et al., 2020). Importantly, the two accounts mentioned above do not have to be self-excluding. For example, Mai and Hoffmann (2014) suggested that bias with foreign-accent speakers might originate from both processing fluency and categorization. They argued that accent induces an immediate categorization of the speaker as an outgroup member and that processing fluency later modifies (reinforces or counteracts) the impact of the categorization effect during communication.

In sum, the role of foreign-accent speakers on message credibility has not been yet fully understood. That is, some findings have shown that foreign speakers are judged as less truthful, due to a decrease in fluency attributed to foreign speech; on the other hand, other evidence has shown that people categorize others based on the language they speak. The purpose of the last part of this thesis is to shed some light on the role of foreign-accent speech on message credibility. In particular, we investigated whether the categorization of the speaker as a foreigner per se could modulate the interpretation of the same message. To do this, the focus has been on the effect of language categorization above the role of intelligibility. To avoid any influence of intelligibility we tested this hypothesis with written materials. Written materials allow us to remove any problem associated with difficult processes of accented speech, by keeping the fluency component similar between native and foreign speakers. Critically, to familiarize themselves with native and foreign speakers, Italian native participants first had to read a bio description of both a native and a foreign speaker and then rate to what degree a series of statements associated with each of the speakers makes sense (Studies 5 and 6) or are true (Study 7).

1.1. Overview of the studies

The present dissertation has three main theoretical research questions:

1 - Does language categorization occur even in bilingual communities?

2 - Does language categorization have a role in shaping social attention?

3 - Does language categorization affect message interpretation?

To answer these questions, three different experimental projects have been carried out. The experimental part of the thesis is presented as a compilation of three research articles. Two of these papers have been published and one has been submitted for publication in internationally recognized journals, all indexed in the Science Citation Index (SCI) or Social Science Citation Index (SSCI). Each of these papers are briefly introduced below concerning the goals of the present dissertation, their contribution to the questions raised in the introduction section and the general experimental design.

1 - Does language categorization occur even in bilingual communities?

The aim of the first paper (Chapter 2) is to investigate the power of language as a cue for social categorization. In particular, we explore whether language categorization is an automatic phenomenon that occurs even when the languages associated with the stimuli (i.e., faces) cannot be ascribed to different social communities.

To achieve this purpose, we tested bilingual communities. Following previous studies, we take advantage of the memory confusion paradigm. In particular, the memory confusion paradigm is a standard way of measuring social categorization implicitly, thus removing social desirability effects (e.g., Taylor et al., 1978; Kurzban, Tooby, & Cosmides, 2001; Susskind, 2007). The logic of the paradigm is that if a particular feature ─ such as language ─ is a basis

of categorization, then people who share the same dimension should be more confused with each other in memory. That is, when trying to recall information, memories of people who share the same language are more likely to be confused with one another, even in the absence of conscious awareness that this is happening. In this sense, patterns of memory confusion reveal fundamental categorization processes. Assuming that linguistic categorization is an automatic process, we predict more same-language errors than different-language errors. That is, when participants make an error attributing a statement to a speaker, they are expected to be more likely to choose a speaker of the same language. To obtain a better description of the role of language in social categorization, we explored two bilingual communities, one in the Basque country, with bilingual Spanish-Basque participants (Study 1) and one in Veneto, with bilingual Italian-Venetian participants (Study 2). Spanish-Basque and Italian-Venetian bilinguals are two typologically different bilingual communities. In study 1, Spanish and Basque are both official languages, while in study 2 Italian is an official language, and Venetian is considered a dialect. It is possible that in these communities, the use of a specific language is associated with different cultural and political sensitivities. For example, the use of Spanish, or Basque, could indicate that the speaker has a different group identification with respect to Spanish and Basque identities; the same situation could happen in relation to the use of Italian or Venetian. If this were the case, instead of, or in addition to language, the participants' cultural and political sensitivities to each language could drive the categorization of speakers in our experimental paradigm. To control the impact of this variable, we used a group identification scale to ensure that our participants were neutral or positive towards Spanish and Basque identities (Study 1) and towards Italian and Venetian identities (Study 2). Finally, we explore whether the language effect on face categorization is modulated by the degree of bilingualism, which we operationalize as the amount of participant's exposure to each of the two languages. By analysing bilingual communities, we will be able to add supporting results

for the role of language as a cue for social categorization, thus verifying whether it functions automatically as it does with other cues, such as age and gender.

2 - Does language categorization have a role in shaping social attention?

The purpose of the second paper (Chapter 3) is to investigate the role of language in shaping social attention. In particular, we explored whether the gaze-cueing effect was modulated by the linguistic identity associated with facial stimuli. To this end, we employed a standard gaze-cueing paradigm (Driver et al., 1999) and manipulate the linguistic identity of the cueing faces through a preliminary familiarization phase.

Two studies were conducted. In both studies, Italian native participants were first familiarized with 8 faces by hearing sentences associated with them; half of the faces were associated with Italian (native language) and the other half with an unknown, foreign, language (Albanian and Basque, in Studies 3 and 4, respectively). Then, in the gaze-cueing task, the faces were used as cueing stimuli. In this task, participants are typically presented with a central face with a direct gaze, and then with a picture of the same face with an averted gaze. Then, a peripheral target appears. In the congruent condition, the target appears in the same spatial location indicated by gaze, whereas, in the incongruent condition, the target appears elsewhere. Participants were instructed to detect the target. Finally, all faces were presented along with the same sentences in a recognition phase. Overall, faster manual responses were expected on congruent trials than on incongruent trials, thus confirming the presence of a reliable gaze-cueing effect. Critically, if the gaze-cueing effect is modulated by the linguistic identity associated with facial stimuli, we expect an interaction between the gaze-cueing effect and language faces. Specifically, a greater magnitude of the gaze-cueing effect is expected in the native language faces compared to the foreign language faces.

Language is interlaced with a specific social status. That is, the language used in a specific sociolinguistic context is used by a specific group of individuals, and we attributed in an automatic manner a specific status to these individuals. Therefore, language is associated with status. Critically, it has been demonstrated that the social status attributed to face stimuli is able to modulate the gaze cueing effect. For example, participants have been shown to shift attention more strongly in response to the averted gaze of a face that was described as depicting a high-status individual (Dalmaso et al., 2012, 2014; Pavan et al., 2011; Zhang et al., 2021). To control for the possible role of language status on the possible interaction between language and the gaze-cueing effect, our participants completed the MacArthur Scale of Subjective Social Status after the main gaze-cueing task.

3 - Does language categorization affect message interpretation?

The aim of the third paper (Chapter 4) is to investigate the role of social categorization based on language in message evaluation. In particular, we explored whether the identification of an individual as a native or a foreign speaker has an impact on under-informative (Study 5) and trivia (Studies 6 and 7) statement judgments, regardless of foreign-accented speech. Indeed, to avoid any influence of physical signals associated with the speech, a written modality presentation of the statements is required, because the use of written materials allows one to investigate whether linguistic identity has an impact on statement judgments by keeping equal fluency processing. In a recent study, Fairchild and Papafragou (2018) also used written materials to isolate the influence of speaker's identity on the acceptability of the scalar implicature. In their study, participants tended to accept more a series of under-informative written sentences ('Some dogs are mammals') when attributed to a foreign speaker compared to native speakers. In the three studies, which are presented in this section, we first aim to

replicate the Fairchild and Papafragou study on scalar implicature (Study 5). To do this, we used as critical items under-informative sentences (e.g., "Some giraffes have long necks") which are literally true but sub-optimal in their manner of conveying information; this under-informative sentence appears to violate the Maxim of Quantity because the speaker used the weaker term on a logical scale ('some') when s/he could have used a stronger and more informative scalar term ('all'). In many contexts, this utterance will lead the listener to infer that not all giraffes have long necks. Subsequently, we used a similar procedure to test unknown statements (Study 6/7); unknown sentences are of particular relevance for this project because the information contained in the sentence is unknown and participants have to rely on the speaker's knowledge. Italian native participants first read a bio description of both a native speaker and a foreign speaker and then rate to what degree a series of statements associated with each of the speakers makes sense (Studies 5 and 6) or is true (Study 7). Importantly, the processing of the fluency between native and foreign speakers was kept constant using written material.

Chapter 2 | The role of language in social categorization

Lorenzoni, A., Santesteban, M., Peressotti, F., Baus, C., & Navarrete, E. (2022). Language as a cue for social categorization in bilingual communities. Plos one, 17(11), e0276334.
DOI: https://doi.org/10.1371/journal.pone.0276334

2.1. Introduction

Categorization is a fundamental human cognitive process that has the function of organizing and processing stimuli quickly and automatically (Bornstein, 1979; Bornstein & Korda, 1984; Liberman et al., 1957). As human beings, each of us belongs to different social categories: we can be categorized, for instance, as young or old, sporty or non-sporty, parents or non-parents. Social categorization refers to the tendency to classify individuals in terms of the categories they belong or do not belong to. Social categorization is an automatic phenomenon that occurs when we meet a new person and can influence the way we perceive people from different groups (Bodenhausen et al., 2012; Bartlett, 1995; Kawakami et al., 2017). Decades of research have been devoted to the study of race, age and gender as the three major cues of social categorization (Allport, 1954; Meissner & Brigham, 2001; Hills, 2012; Palmer et al., 2013; Rhodes & Anastasi, 2012; Wright & Sladden, 2003). Here we focus on another cue that has received less attention. This is the case of the language used by the interlocutor, which remains unknown until she or he starts speaking. Although people may be able to guess which language is spoken by the interlocutor based on the sociolinguistic contexts they live in, as for instance which language is more frequently used in that context, these guesses can be incorrect. Thus, the language of the interlocutor will only be known (and the guesses confirmed or disconfirmed) when the interlocutor speaks.

Recent studies have shown that infants use language to encode individuals in different groups according to the language they speak. For instance, Kinzler, Dupoux and Spelke (2007) observed that 6-month old infants prefer looking at speakers of their same native language than

those who speak a different language. Other studies reported that 11- and 19-month old infants, when learning new information, look more frequently at members belonging to the same linguistic group than at people of a different linguistic group (Begus et al., 2016; Howard et al., 2014; Liberman et al., 2017). These results with the language cue would be analogous to what has been observed with other cues, such as race and gender (Weisman et al., 2015; Quinn et al., 2002).

Empirical investigations on the role of language as a cue for categorization in adults focused initially on accent, that is, the peculiar pronunciation of a group of individuals from a particular region. Pietraszewski and Schwartz (2014a, see also Pietraszewski & Schwartz, 2014b) have exploited the logic underlying the memory confusion paradigm (Klauer & Wegener, 1998; Taylor et al., 1978), whereby, if an individual's feature is a cue for categorization, then individuals sharing this feature will be more likely to be confused between each other than between individuals not sharing this feature. In their study, participants were first exposed to pairings of faces and audio statements. Half of the statements were uttered in an English accent (e.g., American accent) and the other half in a different English accent (e.g., British accent). After a brief distractor task, participants were asked to determine which speaker made each statement by selecting the appropriate face from an array containing all the faces. The results showed that when participants incorrectly attributed statements to speakers, they were more likely to choose a speaker with the same accent as the original speaker. That is, participants made more same-accent errors, confusing speakers from the same accent category, than between-accent errors, confusing speakers from the different accent category. These results were interpreted as evidence that accent is a cue for automatic and implicit categorization of faces.

In a recent study Baus, Ruiz-Tada, Escera & Costa (2021) have replicated this finding with two different languages instead of two different accents of the same language.

Specifically, Spanish participants were exposed to Spanish and English statements. Similar to what was obtained by Pietraszewski and Schwartz (2014a), same-language errors were more frequent than between-language errors. Interestingly, Baus and colleagues further measured the electrophysiological activity associated to language categorization in an oddball paradigm. The ERP analysis showed an early visual mismatch negativity (vMMN) for between-language category faces, but not for within-category faces. This result seems to indicate that language categorization influences the early stages of face processing. In sum, findings from the memory confusion paradigm suggest that people group individuals (i.e. faces) according to the language (or accent) they speak. Moreover, at the neural level, such categorization is an automatic process able to modulate early visual perceptual processing. The present study aims to define the boundaries of this phenomenon.

One common feature of the studies conducted so far refers to the fact that the accents or languages used in the studies belonged to two different sociolinguistic contexts. For instance, participants in Pietraszewski and Schwartz's studies were American citizens from California who were tested with different English accents, including American, British, or Irish. Thus, the accents tested belonged to two different communities, in this case, two English-speaking countries. Similarly, in the study by Baus and colleagues, participants were Spanish dominant, had English as a foreign language and belonged to a sociolinguistic community where Spanish is an official language while English is not. It is therefore possible that participants are not only categorizing faces according to the accent or language they speak, but they are also categorizing faces mediated by the different sociolinguistic communities to which these faces could be ascribed. Some empirical findings would be congruent with this possibility. It is known that foreign accent generates an immediate classification of the speaker as an out-group member and that such classification activates the stereotypes and stigmas associated to this group (Giles & Watson, 2013; Nguyen, 1993; Ryan, 1983; Wated & Sanchez, 2006; Weyant, 2007).

Therefore, participants could classify speakers according to the accent or language they speak and/or the stereotypes associated. At the same time, some studies have suggested a role of this kind of social stereotypes on speaker recognition (Bestelmeyer et al., 2015; Bresnahan et al., 2002; Cargile & Giles, 1997). The main aim of the present study was to explore whether language categorization is an automatic phenomenon occurring even when the languages associated to the stimuli (i.e., faces) cannot be ascribed to different social communities. To do this we tested bilingual communities.

People living in a bilingual community are regularly exposed to both single and dual language interaction contexts. More critical for our purposes, an individual from this community may be associated with the two languages used in the community rather with a single language. That is, unlike what normally occurs in monolingual communities where there may be a one-to-one correspondence between interlocutor and language, in bilingual communities there may be a one-to-two correspondence. Interestingly, bilingual speakers seem to be sensitive to this correspondence. Recent studies have shown that bilinguals are able to adapt to language-contexts based on prior knowledge about interlocutors. For instance, Molnar, Ibáñez-Molina and Carreiras (2015) familiarized Basque-Spanish bilinguals with three different interlocutors who spoke Spanish, Basque, or both languages. Immediately after the familiarization, participants completed an audio-visual lexical decision task in which the interlocutors produced target words in Spanish or Basque. Reaction times were faster when the language the interlocutors spoke at the lexical decision task matched the language used during familiarization with respect to when the language did not match. In an event-related potential adaptation of Molnar at al.'s study, Martin, Molnar and Carreiras (2016) observed that faces associated to one language (i.e., monolingual speakers) elicited a larger early negativity ERP component compared to those associated with two languages (i.e., bilingual speakers). The difference in the ERP deflection was reliable even before the speaker started to speak,

suggesting that faces might convey information pertaining to the language(s) associated with the face. These studies suggested that bilinguals are able to anticipate which language their interlocutor will use, congruent with some models of bilingual language control (Green & Abutalebi, 2013; Blanco-Elorrieta & Caramazza, 2021).

In the present study, we test whether language automatically functions as a cue for face connotation, even in conditions in which language does not clearly distinguish between different social groups (i.e., when the languages at test belong to the same sociolinguistic context). Participants were bilingual speakers living in a bilingual community, who are exposed daily to the two languages of their community. We took advantage of the memory confusion paradigm. If language categorization is an automatic process, we expected to replicate previous findings and observe more same-language errors than different-language errors; that is, when participants make an error attributing a statement to a speaker, they are expected to be more likely to choose a speaker of the same language. By contrast, if language categorization is contingent on sociolinguistic categorization, the effect should appear only when languages are ascribed to different social groups, as was the case in the studies by Pietraszewski and Schwartz (2014), and Baus et al (2021). Under this latter hypothesis, no language categorization effect should be expected in our studies, where the languages used belong to the same sociolinguistic context in which the bilingual participants are exposed daily to faces speaking those languages.

To obtain a better description of the categorization role of language within bilingual contexts, we tested two different types of bilingual communities. In the first study, we tested Spanish and Basque, two typologically different languages: Spanish is a Romance language from the Indo-European language family while Basque is a non-Indo-European language isolate (Hualde & De Urbina, 2003; Laka Mugarza, 1996). Both are co-official languages in the Basque Autonomous Community and Navarra (northeastern Spain). In the second study, we tested two varieties of the Romance language family: Italian and the Veneto dialect

(Maiden, 2014; Ferguson, 2007). The Veneto dialect is a non-official regional language spoken in Veneto, a northeastern region of Italy, where the only official language is Italian (Maiden, 2014; Tuttle, 1997a; see also Cipolletti et al., 2016). It is possible that in these communities the use of a specific language is associated with different cultural and political sensitivities. For example, the use of Spanish, or Basque, could indicate that the speaker has a different group identification with respect to Spanish and Basque identities; the same situation could happen in relation to the use of Italian or Venetian. If this were the case, instead of, or in addition to language, the participant's cultural and political sensitivities towards each language could drive the categorization of speakers in our experimental paradigm. To control the impact of this variable, we used a group identification scale to ensure that our participants were neutral or positive towards Spanish and Basque identities (Study 1) and towards Italian and Venetian identities (Study 2).

A second goal of the current research was to explore whether the language effect on face categorization is modulated by the degree of bilingualism, which we operationalize as the amount of participant's exposure to each of the two languages. In their study, Molnar and colleagues (2015) tested two groups of Spanish-Basque bilinguals. One group was composed of balanced (highly proficient) bilinguals who acquired Basque before the age of three and reported using both languages on a daily basis with family, friends, and colleagues. The other group was composed of unbalanced (less proficient) Spanish-Basque bilinguals who started learning Basque in school-settings between the age of 9 and 14 and reported using Spanish as the primary language for daily communication. Only balanced bilinguals showed adaptation of their language comprehension processes to the linguistic identity of the interlocutor. Such an effect was not observed in the unbalanced bilinguals' group. To explore the extent to which language exposure affects the language categorization phenomenon, we estimated the relative

use of each language for each participant and we added this measure as a continuous predictor to the main analysis (see for a similar procedure, Cunnings, 2012).

In sum, as a main hypothesis, more same-language errors than different-language errors were expected in the two populations of bilinguals. Such a result would be congruent with the assumption that language categorization is an automatic process. In addition, in further analyses we explored whether language exposure in daily social interactions modulated this effect.

2.2. Study 1: Spanish-Basque bilinguals

Materials and methods

The study was preregistered as a Research Report Protocol (Lorenzoni et al., 2021). All experimental procedures were approved by the local Research Ethics Committees of the University of Padova (Protocol number: 3589; Title: *The social bilingual brain*).

Participants. 50 Spanish-Basque bilingual participants took part in Study 1 (31 female). All participants were required to give written informed consent. As mentioned in the Research Report Protocol, the number of participants satisfied the required sample size based on a statistical power analysis (GPower 3.1; Faul et al., 2007). Statistical power analysis was based on data from Study 1 by Pietraszewski and Schwartz (2014). In that study, 30 participants were tested with the same experimental design as our current study. The correlation index of the paired t-test between Same-accent errors and Different-accent errors was $r = 0.78$ ($t = 6.62$; $p < .001$). With alpha = .05 and power = 0.95, the anticipated sample size required to obtain a significant effect is $n = 25$. In contrast to the study by Pietraszewski and Schwartz (2014), our

study will be an online study. Recent studies have validated psychological research based on internet samples (Goslin et al., 2004; Goslin & Mason, 2015). However, following Brysbaert's suggestion (2019), we have decided to run a more well-powered study than the original one and we will double the sample size required. Moreover, we would like to evaluate the impact of degree of bilingualism as a continuous variable. This type of analysis needs larger samples.

Materials. Eight gray-scale photographs of male Caucasian faces were taken from Martinez & Benavente (1998). All of them were emotionally neutral and had no extra visual details. Twenty-four non-autobiographical sentences were created and then recorded in Spanish and Basque using the software Audacity (v 2.0.3) (e.g., *La tienda se queda vacía – Denda hutsik geratu da*; "The store becomes empty", in Spanish and Basque, respectively). The differences in length between Spanish and Basque sentences were measured by calculating the number of phonemes because words are not a good unit for comparing Spanish and Basque. This is because Basque is an agglutinative language, and all determiners and prepositions are embedded with their nouns, while in Spanish determiners and prepositions are separated. The number of phonemes did not diverge between Spanish [mean = 19.58 phonemes, range = 13-25] and Basque [mean = 20 phonemes, range = 12-22] ($t < 1$) sentences. Recording durations for sentences in Spanish [mean = 1.91 seconds, range = 1.52-2.48] and Basque [mean = 1.84 seconds, range = 1.05-2.49] did not differ ($t(46) = 0.79$, $p = .42$). Four male native Spanish speakers and four male native Basque speakers recorded the sentences. The final design consisted of photographs of faces accompanied by a voice speaking either in Spanish or in Basque. Sixteen lists were created to counterbalance the face, sentence and language. Therefore, all faces accompanied every sentence in both languages across all participants.

Procedure. The experiment consisted of four parts: an encoding phase, a distractor task (*tetris game*), a recognition phase and a questionnaire (see below). At the beginning of the

experiment, the participant was only aware of the first phase and was informed that the study will take approximately 15 minutes. In the initial encoding phase, photographs of faces were presented on the screen one at a time along with the auditory presentation of the sentences. Participants were only asked to form impressions about the speakers as they watched and listened because later they were going to be asked questions about them. Trial structure was the following: one photo and audio were presented simultaneously on the screen. Each speaker's photo was displayed for the entire duration of the statement, plus two additional seconds thereafter, followed by a blank presented on the screen for 200ms (Figure 1). Each of the 8 faces was presented 3 times during the encoding phase, for a total of 24 presentations. The three presentations of each face had three different sentences, but the voice was the same. In other words, each face was paired with the same voice and was associated with three different sentences. The language of the sentences in the first two positions was counterbalanced between the lists so that 8 lists started with two Spanish sentences and 8 with two Basque sentences. Language order was unsystematic thereafter, within the constraint that each speaker spoke once during statements 1–8, once again in statements 9–16, and once in statements 16–24. Upon completion of the encoding phase, participants were engaged in a distractor filler task (Tetris game) for 2 minutes to avoid having the recognition phase immediately after the encoding phase.

After that, participants started the second phase of the memory confusion paradigm, the recognition phase, in which all 8 photographs were presented on the screen, numbered from 1 to 8. Face order was randomized across trials. Then, the same 24 sentences of the encoding phase were presented again in auditory form. The participant decided which of the 8 faces accompanied the sentence in the encoding phase by clicking on the corresponding number. The eight faces remained on the screen until the participant's response, after which a blank screen

lasting 1000 ms was presented (see Figure 1). This procedure continued until all 24 sentences of the encoding phase were presented. The experiment lasted about fifteen minutes.

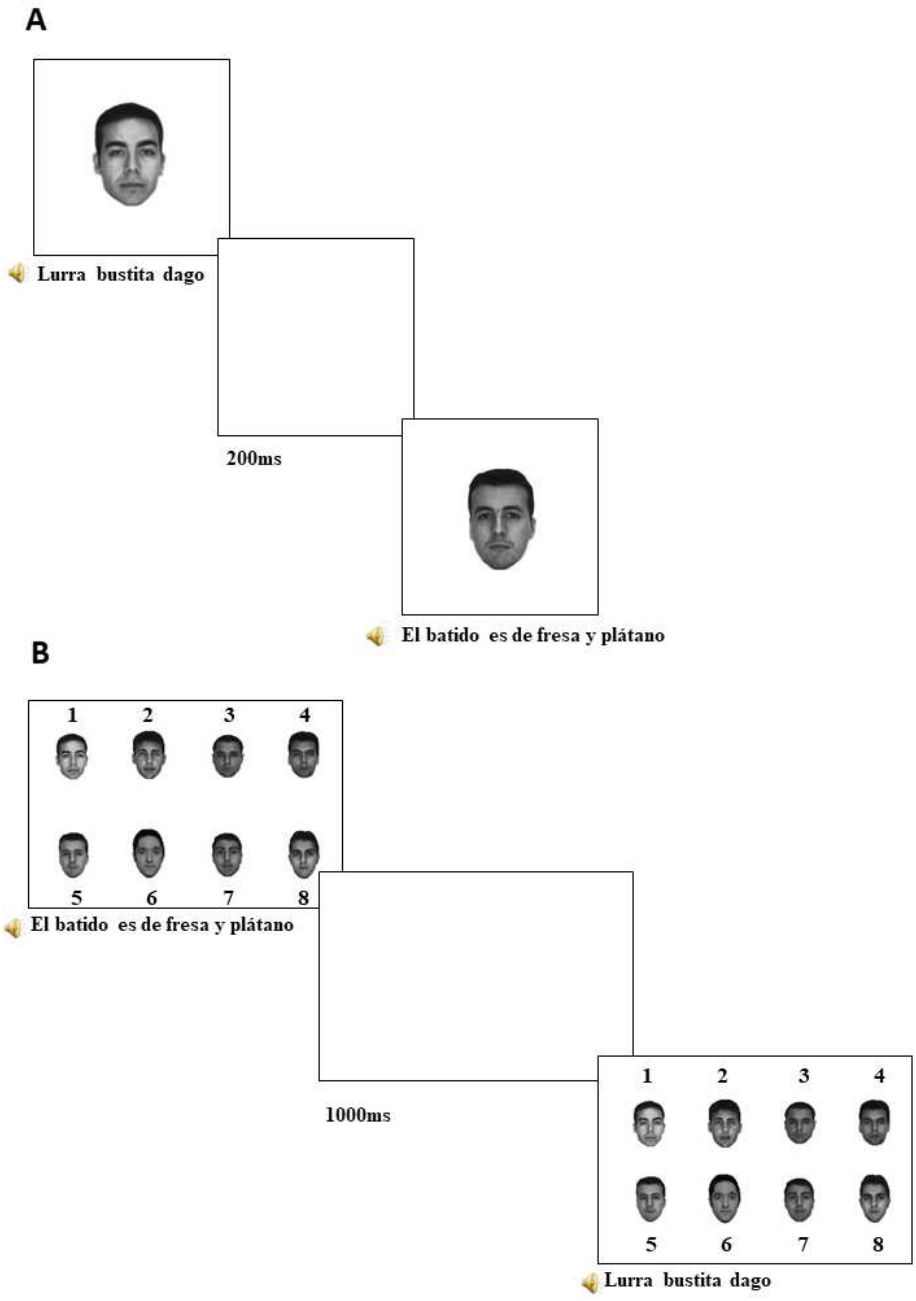


Figure 1. The procedure of the memory confusion paradigm. This diagram shows the two main phases of the paradigm. On Panel A, the encoding phase, where faces were presented with the audio sentences. On panel B, the final recognition phase. Grayscale photos of eight Caucasian males with neutral expressions were selected from the free AR face database (Martinez & Benavente, 1998).

After the recognition phase, participants completed the questionnaire which consisted of four parts: a) *general information* concerning the language the participant used as a child

and the age of acquisition; b) *perceived proficiency,* in which the participant rated his/her degree of perceived proficiency in comprehension and production using a 1-10 point scale (1="none"; 10="perfect") in both languages; c) *language use*, in which the participant quantified the use of each language in various daily activities; and d) *group identification*, where the participant's level of identification with their groups (i.e., Spanish and Basque, or Italian and Venetian for Study 1 and Study 2, respectively) was assessed in 4 questions using a 1-7 point scale (1="not at all"; 7="very much"). These questions were based on research by Latrofa, Vaes, Pastore & Cadinu (2009). In order to ensure that our participants were highly proficient and able to interact in both languages, only results of those participants with a mean >6 in part b of the questionnaire (*perceived proficiency)* in both languages were analysed. A Relative Use Index was calculated for each participant applying the following formula to the daily activities answered in part c of the questionnaire (*language use)*: (value in language A - value in language B) / (value in language A + value in language B). The mean between the scores obtained in all daily activities corresponds to the Relative Use Index for a particular individual. This ratio will score from -1 to 1. The value of 0 indicates a perfectly balanced bilingual, that is, with a similar amount of use of the two languages. Positive or negative values indicate the inclination of use towards one language or the other (see Appendix A for the full questionnaire in Italian).

At the end of the experimental session, participants were thanked and debriefed by describing the real aims of the experiment. In addition, participants were again asked for their consent for their results to be used.

Methodology for data collection. The experiment took place online, through the *PCIbex* platform (2018). Participants were to access the test by clicking on a link. Participants

were recruited through the participant pool database of The Bilingual Mind research group (https://www.ehu.eus/HEB/) of the University of Basque Country.

Methodology for analysis. First, to test for the presence of a Language effect, categorization was measured on a participant basis by calculating the difference in error rates between same-language errors and different-language errors. While there are only three possibilities to make same-language errors (because one of the faces is the correct answer), there are four possibilities to make a different-language error. To correct for this discrepancy, the number of different-language errors was multiplied by 0.75. Following previous studies that have used this paradigm (Pietraszewski & Schwartz, 2014a; 2014b) paired t-test analyses were performed between same-language and different-language errors (see Pietraszewski, 2018 for validation of this method). To explore the influence of language exposure on the language categorization effect, the Relative Use Index was added as a fixed effect in a linear model. As a sanity check to control whether the memory confusion paradigm is doing what it is supposed to do, we expected error rates to be high. In particular, according to the previous literature (Pietraszewski & Schwartz, 2014a; 2014b) error rates should be greater than 50%.

Moreover, being an online experiment, it is important to control for participant's performance during the task. To this end, reaction time measures in the recognition phase were collected as a control measure. These response times served to assess the participant's level of engagement in the task. Participants with a mean response time faster or slower than 2.5 standard deviation of the mean group were considered outliers and removed from the analysis. Additionally, although previous studies did not measure response time, we aimed to explore whether participants were slower selecting incorrect than correct faces as well as whether response time differences were revealed for incorrect ingroup face selection (i.e., same-language errors) as compared to incorrect outgroup face selection (i.e. different-language

errors). Data and scripts for analysis are avaiable on the OSF platform at the following link https://osf.io/3fudg/.

Predictions. Assuming that linguistic categorization is an automatic process, we predict more same-language errors than different-language errors. That is, when participants make an error attributing a statement to a speaker, they are expected to be more likely to choose a speaker of the same language. In addition, based on a previous study (Molnar et al., 2015), we predict a positive correlation between the Relative Use Index covariate and categorization.

Results. From the 50 participants that performed the experiment, one participant with a *perceived proficiency* lower than 6 in Basque was excluded. The mean Relative Use Index was 0.21, indicating that participants used more Spanish than Basque in their daily activities and social communications. See Table 1 for participant descriptive variables.

Table 1. Mean participants' descriptive variables for Study1. Standard deviations are reported in parentheses.

Age	Group identification Spanish	Group identification Basque	Relative Use Index	Proficiency Spanish	Proficiency Basque
24.58 (8.01)	2.47 (1.24)	5.55 (1.42)	0.21 (0.50)	9.13 (0.95)	8.87 (1.05)

Language categorization. Participants made an average of 19.12 total errors (SD=3.84) out of 24 responses, making a mean error rate of 79%. The paired t-test showed that participants made significantly more same-language errors (9.36, SD=3.62) than different-language errors (7.31, SD=3.06; t(48)=2.360, p=.022). See Figure 2.

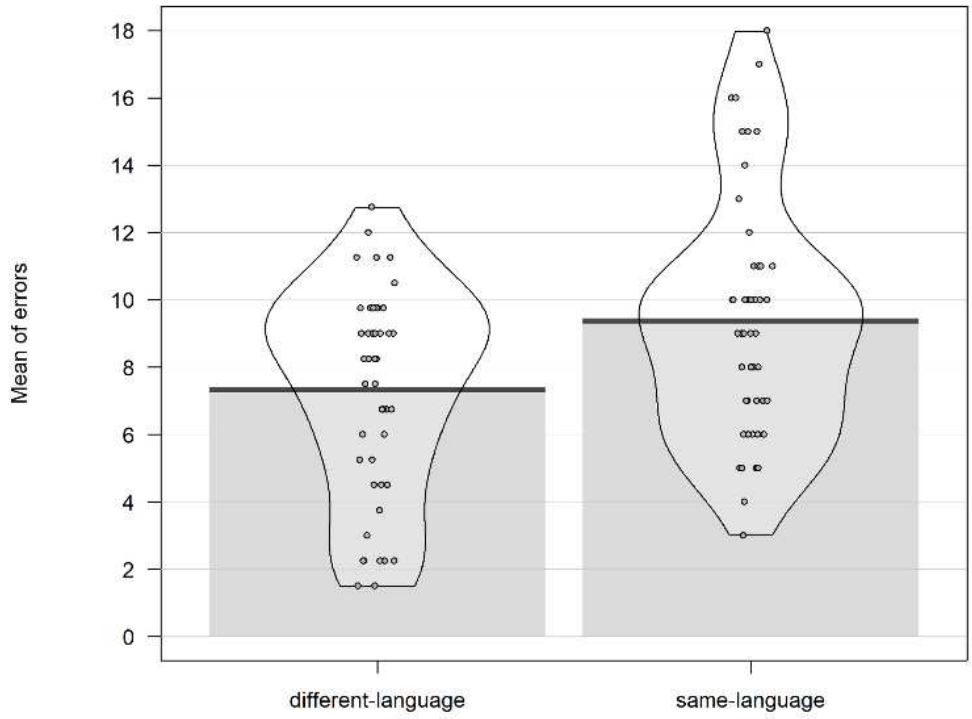


Figure 2. Language categorization. Mean of errors split by type of error for Study1.

The Relative Use Index was introduced as a fixed effect in a linear model with the difference between same-language and different-language errors on a participant basis as dependent variable. The effect of Relative Use Index was not significant (SE=1.78, t=0.06, *p*=.95).

The same type of analysis was done with the *group identification* scales. Specifically, the Spanish and the Basque group identification scales were included as fixed effects in a linear model with the difference between same-language and different-language errors on a participant basis as dependent variable. None of the scales yielded significant effects (Spanish group identification: SE=.76, t=.50, *p*=.61; Basque group identification: SE=.67, t=1.11, *p*=.27). In a further analysis, we explored the Language effect on those participants who showed a score greater or equal to 3 in both group identification scales. The paired t-test showed that participants made more same-language errors (9.45, SD=3.06) than different-

language errors (7.57, SD=2.46). This difference was however not significant (t(19)=1.69, *p*=.11), probably due to the small sample size, 21.

Reaction time (RT) analysis. Linear-mixed effects regressions were performed on the reaction times using the lme4 package (Bates et al., 2015). In the mixed model, the factor Response Type (correct, error) was introduced as fixed effect, and Participant and Item as random effects. As the data were not normally distributed, we used the Box-Cox test (Box & Cox, 1964), using the function boxcox in the package "MASS" (Venables & Ripley, 2002) to estimate the most appropriate transformation for the data to reduce skewedness and approximate a normal distribution. Participants were faster selecting the correct response compared to when an incorrect choice was performed (SE=.38, t=2.88, *p*=.004, See Figure 3A). In a second level of analysis, we tested whether there was a difference between RTs to same-language and different-language incorrect choices. No significant differences emerged (SE=.35, t=.54, *p*=.59, See Figure 3B).

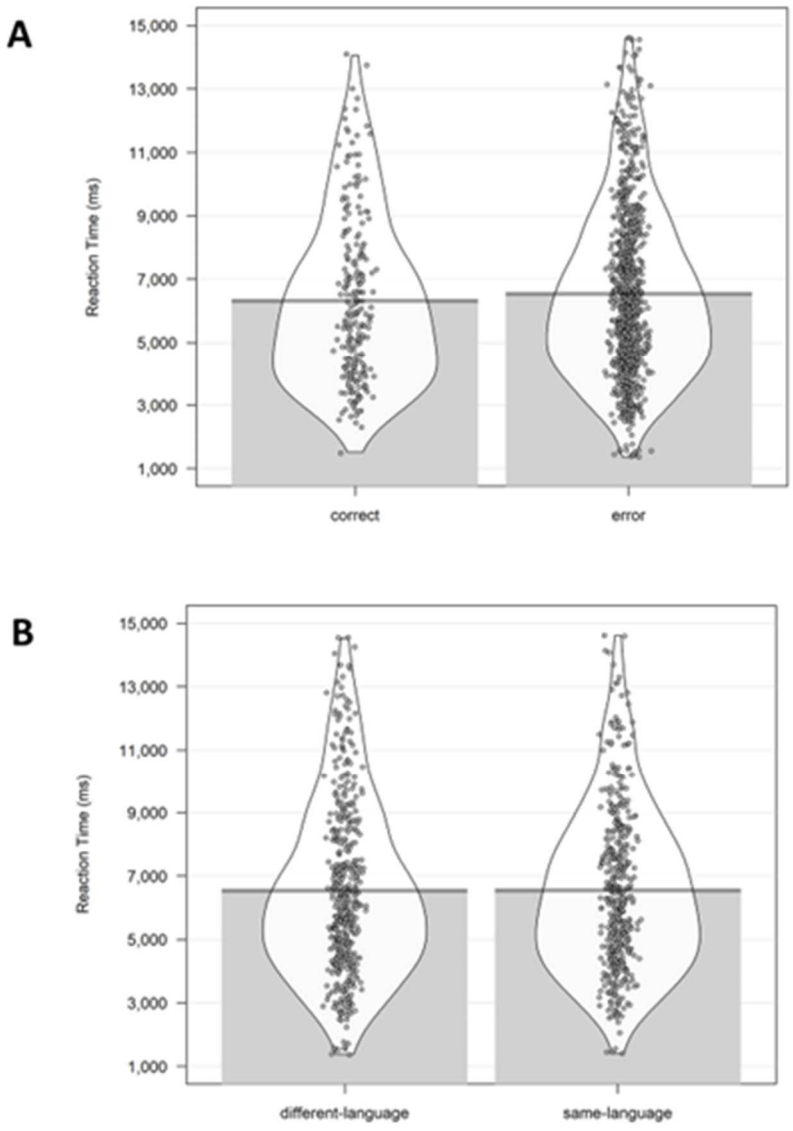


Figure 3. Analysis on Reaction Time for Study 1. (A) RT results between corrected answers and errors. (B) RT results between same-language and different-language errors. RTs in the figure are not transformed.

2.3. Study 2: Italian-Venetian bilinguals

Materials and methods

Participants. 68 Italian-Venetian bilingual participants took part in Study 2 (27 female). All participants were required to give written informed consent.

Materials. The same eight gray-scale photographs of male Caucasian faces as in Study 1 were used in Study 2. Twenty-four non-autobiographical sentences were created and then recorded in Italian and Venetian (*Il pane fresco è finito - El pan fresco l'è finio;* "The fresh bread is finished", in Italian and Venetian, respectively) using the software Audacity (v 2.0.3). Sentences' word length did not diverge between Italian [mean = 5.45 words, range = 4-8] and Venetian [mean = 5.58 words, range = 4-8] ($t < 1$). Four male native Italian speakers and four male native Venetian speakers recorded the sentences. Recording durations for sentences in Italian [mean = 2.01 seconds, range = 1.44 - 2.52] and Venetian [mean = 1.91 seconds, range = 1.35-2.79] did not differ ($t(46) = 1.01$, $p = .31$). The final design and list were identical to Study 1.

Procedure. Identical to Study1.

Methodology for data collection. Identical to Study 1. Participants were recruited through a 'snowball' procedure using social media**.**

Methodology for analysis. Identical to Study1.

Predictions. Identical to Study1.

Results. From the 68 participants that performed the experiment, 8 participants with perceived proficiency lower than 6 in Venetian were excluded. The mean Relative Use Index was 0.59, indicating that participants used more Italian than Venetian in their daily activities and social communications. One participant whose mean RT was slower than 2.5 standard deviation of the group mean was excluded from the analysis, so that the final analysis included 59 participants. See Table 2 for participant descriptive variables.

Table 2. Participants descriptive variables for Study2. Standard deviations are reported in parentheses.

Age	Group identification Italian	Group identification Venetian	Relative Use Index	Proficiency Italian	Proficiency Venetian
37.95 (14.29)	4.64 (1.39)	4.97 (1.59)	0.59 (0.37)	9.38 (0.86)	8.28 (1.21)

Language categorization. Participants made an average of 19.13 total errors (SD=3.24) out of 24 responses, making a mean error rate of 80%. The paired t-test showed that participants made significantly more same-language errors (9.54, SD=3.11) than different-language errors (6.94, SD=2.54, t(58)=4.01, p<.001). See Figure 4.

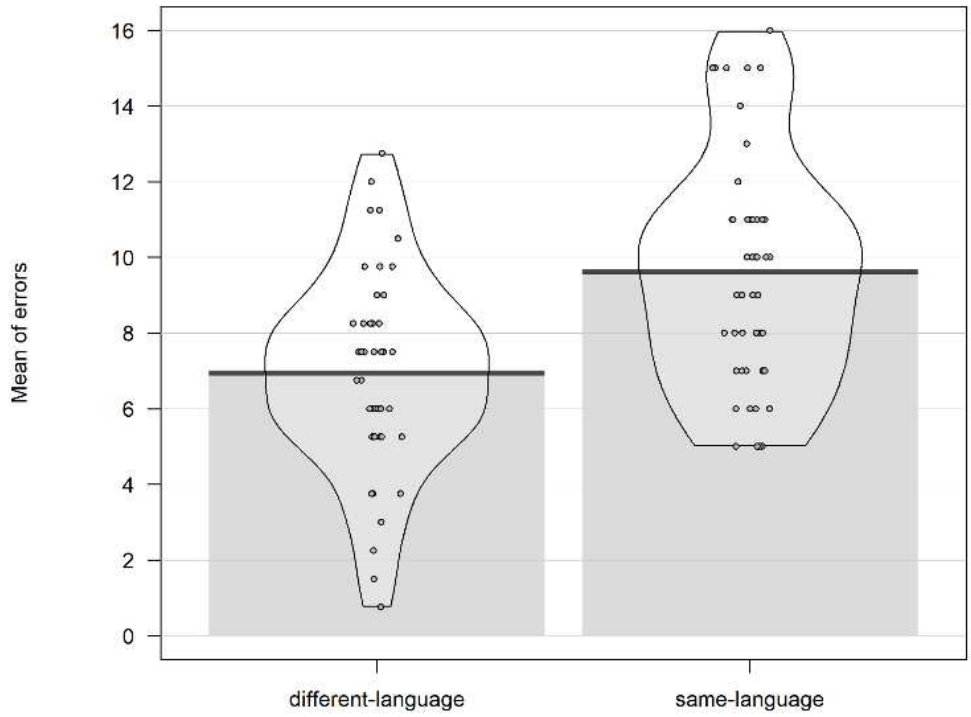


Figure 4. Language categorization. Mean of errors split by type of error for Study2.

The effect of the Relative Use Index and the effect of group identification scale were analysed as in Study 1. Neither the effect of Relative Use Index (SE=1.76; t=-1.01; p=.31) nor the effects of group identification scales were significant (Italian group identification: SE=.47, t=-1.39, *p*=.17; Venetian group identification: SE=.41, t=-.27, *p*=.79).

Reaction time (RT) analysis. The same analysis performed in Study 1 were used in Study 2. No RT difference emerged for selecting the correct compared to the incorrect response (SE=.026, t=1.43, *p*=.15, See Figure 5A). As in Study 1, no difference between RTs to the same- and different-language incorrect responses was found (SE=0.02, t=-0.01, *p*=.99, See Figure 5B).

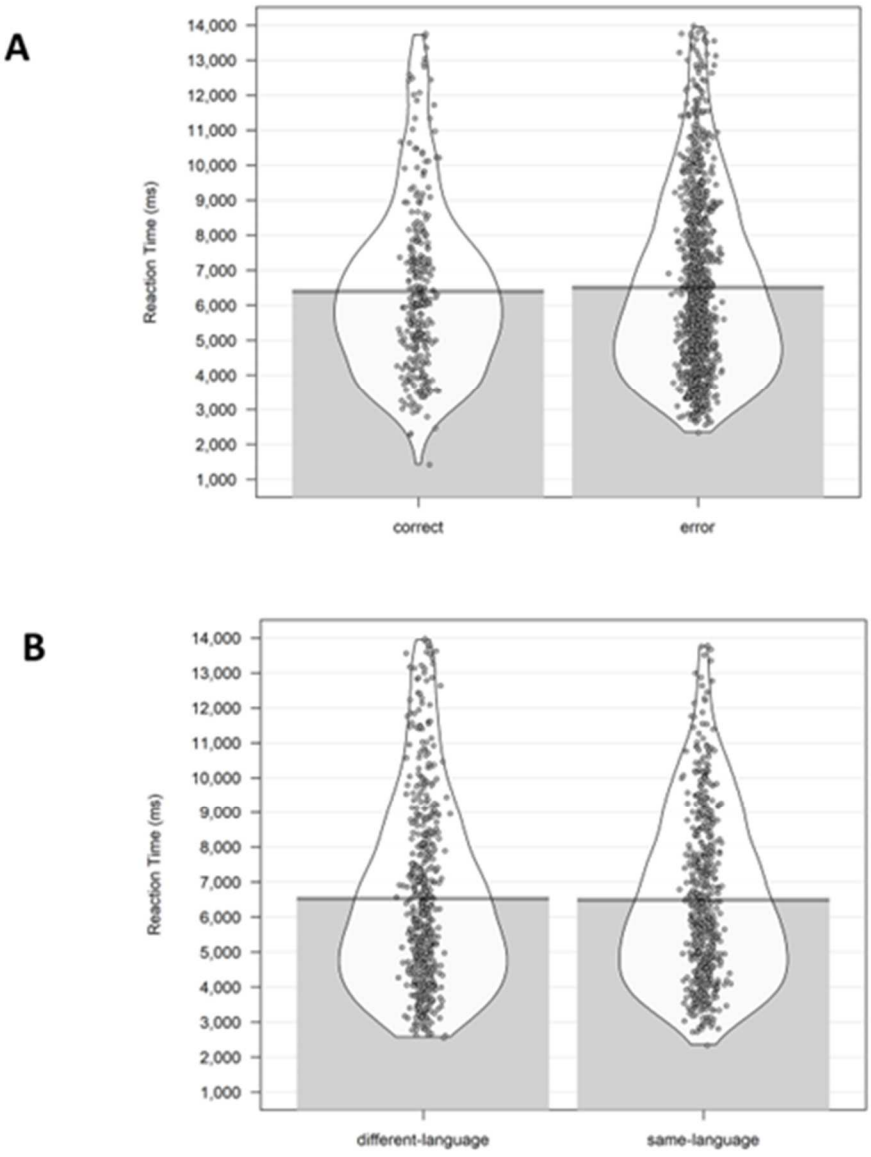


Figure 5. Analysis on Reaction Time for Study 2. (A) RT results between corrected answers and errors. (B) RT results between same-language and different-language errors. RTs in the figure are not transformed.

2.4. General discussion

It has been shown that people use speakers' language as a cue for social categorization. In two studies, we examined whether bilingual participants who daily use both their languages in several contexts within their community still use language for categorizing speakers. Two groups of bilinguals were involved: Spanish/Basque speakers in Study 1 and Italian/Venetian speakers in Study 2. Using the memory confusion paradigm, we first exposed bilingual

participants with eight male faces, half producing statements in one language and the other half in another language. At the test phase, participants were required to identify which speaker produced each statement.

In both studies, we showed that participants were more likely to confuse faces from the same-language group than from the different-language group. These findings clearly indicate that language is used as a social cue to categorize other individuals' faces even within bilingual communities, where language does not discriminate between social groups.

A second goal of the present research was to explore whether the categorization based on language is modulated by the degree of social interaction within each language. That is, whether the amount of time participants interact in each of the two languages is a factor modulating their categorization effect. Our results reveal that the amount of language interaction, as measured by the participants' Relative Use Index, is not a critical factor determining the categorization effect. Furthermore, we explored whether the *group identification* towards one language identity or the other language identity modulates the categorization. Once again, our results reveal that group identity does not have an effect on the categorization based on language.

In sum, we show that the categorization effect is also present in communities in which the language is not critical for categorizing people, since we have generalized and replicated the effect with two bilingual communities where both languages are used in a daily basis. Interestingly, this happens when both languages are officially recognized, as Basque and Spanish in Study 1, and also when bilinguals use an official language and a non-official regional language, as Italian and Venetian in Study 2. Still, there are interesting questions to be addressed, such as if the same result should be obtained in those bilingual communities where individuals are classified into different groups because of the social-economic status

associated to the language they used. For example, in India, English is recognized as the second official language along with Hindi. Critically, the colonial association of English with power, health and social-economic status continue to hold to date (Annamalai, 2004).

In conclusion, to the best of our knowledge, this is the first evidence showing language categorization effects in bilingual communities. Past studies investigating the role of language as a cue for social categorization have used two languages (or accents) that belonged to two different sociolinguistic contexts (Pietraszewski & Schwartz, 2014; Baus et al., 2021). The use of bilingual communities is critical to determine whether categorization based on language is an automatic phenomenon. Our results suggest that this is the case.

2.5. Appendix

Appendix A. Questionnaire used to evaluate a) general information; b) perceived proficiency; c) language use; and d) group identification

Buongiorno, ti chiediamo ora di completare l'ultima parte di questo studio che riguarda la tua competenza linguistica.

Prima di cominciare, ti chiediamo alcune informazioni che riguardano la tua persona

- Per favore, indica qui la tua età
- Per favore, indica qui il tuo genere
  -M
  -F
  -Preferisco non rispondere

- Quando studiavi alle scuole superiori, quale era la lingua veicolare dominante?
  -Italiano
  -Un'altra lingua

- Quando eri un/a bambino/a, quale era la lingua con cui parlavi con le seguenti persone?
  -tua mamma
  Italiano [] Veneto [] entrambe [] nessuna[]

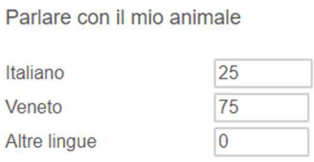
  -tuo papà
  Italiano [] Veneto [] entrambe [] nessuna[]

-tua sorella/e e/o fratello/i
Italiano [] Veneto [] entrambe [] nessuna[]

-i tuoi nonni
Italiano [] Veneto [] entrambe [] nessuna[]

- Indica, con un numero, a che età hai imparato l'Italiano
- Indica, con un numero, a che età hai imparato il Veneto

- Per ognuna delle attività quotidiane che ti verranno presentate, ti chiediamo di completare indicando la percentuale di tempo in cui utilizzi il Veneto e l'Italiano. Ad esempio, se hai un animale e sei abituato/a a parlare con lui per la maggior parte del tempo (ad esempio tre volte in più) in Veneto rispetto all'Italiano, dovrai rispondere come nell'immagine qui sotto.



- Parlare con i/le commesse nei negozi
  Italiano (%) []
  Veneto (%) []
  Altre lingue (%) []

- Famiglia (in generale)
  Italiano (%) []
  Veneto (%) []
  Altre lingue (%) []

- Amici
  Italiano (%) []
  Veneto (%) []
  Altre lingue (%) []

- Compagno/a
  Italiano (%) []
  Veneto (%) []
  Altre lingue (%) []
  Non ho un/a compagno/a O

- Lavoro
  Italiano (%) []
  Veneto (%) []
  Altre lingue (%) []
  Non ho un lavoro O

- In generale, che % delle tue interazioni con altre persone avviene in
  Italiano (%) []
  Veneto (%) []
  Altre lingue (%) []

Indica il livello di competenza da 1 (molto basso) a 10 (molto alto) delle due lingue in ogni campo. Per favore, considera che potrebbe essere molto utile utilizzare i valori intermedi della scala

- Livello di competenza nell'ascoltare
  Italiano 1(molto basso) 2 3 4 5 6 7 8 9 10 (molto alto)
  Veneto 1(molto basso) 2 3 4 5 6 7 8 9 10 (molto alto)

- Livello di competenza nel parlare
  Italiano 1(molto basso) 2 3 4 5 6 7 8 9 10 (molto alto)
  Veneto 1(molto basso) 2 3 4 5 6 7 8 9 10 (molto alto)

- Indica per favore qui sotto quanto consideri te stesso/a competente in generale da 1 (molto basso) a 10 (molto alto) nelle seguenti lingue:
  Italiano 1(molto basso) 2 3 4 5 6 7 8 9 10 (molto alto)
  Veneto 1(molto basso) 2 3 4 5 6 7 8 9 10 (molto alto)

- Quanto ti senti parte della popolazione veneta?
  1(per niente) 2 3 4 5 6 7(molto)

- Quanto sei orgoglioso/a di essere veneto/a?
  1(per niente) 2 3 4 5 6 7(molto)

- Essere un/a italiano/a del nord (veneto) è un aspetto centrale di te stesso/a?
  1(per niente) 2 3 4 5 6 7(molto)

- Essere veneto/a quanto influisce sul tuo modo di essere e di pensare?
  1(per niente) 2 3 4 5 6 7(molto)

- Quanto ti senti parte della popolazione Italiana?
  1(per niente) 2 3 4 5 6 7(molto)

- Quanto sei orgoglioso di essere italiano/a?
  1(per niente) 2 3 4 5 6 7(molto)

- Essere un/a italiano/a è un aspetto centrale di te stesso/a?
  1(per niente) 2 3 4 5 6 7(molto)

- Essere italiano/a quanto influisce sul tuo modo di essere e di pensare?
  1(per niente) 2 3 4 5 6 7(molto)

Il questionario è terminato. Grazie mille per la tua partecipazione!

Appendix B. Sentences used in Study1 and Study2.

Sentences	**English Translation**	**Number of words**	**Record duration (s)**	**Number of sounds**	**Language**
Il pane fresco è finito	Fresh bread is finished	5	2.139	-	Italian
Il bambino suona il flauto	The child plays the flute	5	1.951	-	Italian
Tengo i libri nell'armadio	I keep the books in the closet	4	1.677	-	Italian
Ho tagliato i rami del pero	I cut the branches of the pear tree	6	1.799	-	Italian
La focaccia è sopra il tavolo	The focaccia is on the table	6	2.133	-	Italian
Quella casa ha la porta rossa	That house has a red door	6	2.171	-	Italian
La minestra era senza sale	The soup was without salt	7	2.021	-	Italian
Questo berretto è troppo stretto	This cap is too tight	5	2.423	-	Italian
La maestra fa lezione	The teacher teaches	7	1.989	-	Italian
Il maglione di lana è caldo	The wool sweater is warm	8	2.347	-	Italian
Per terra è pieno di briciole	On the ground it is full of crumbs	5	2.196	-	Italian
Il tetto ha delle tegole rotte	The roof has broken tiles	4	2.072	-	Italian
D'inverno il sole va giù in fretta	In winter the sun goes down quickly	5	2.292	-	Italian
I cani abbaiavano al postino	The dogs barked at the postman	5	2.339	-	Italian
L'albero ha fatto un sacco di arance	The tree made a lot of oranges	4	2.521	-	Italian
Il vaso si è rotto in tanti pezzi	The vase broke into many pieces	6	2.273	-	Italian
La candela si è spenta	The candle went out	6	1.858	-	Italian

Ieri pioveva, oggi nevica	Yesterday it was raining. today it is snowing	6	1.881	-	Italian
La coperta è sul letto	The blanket is on the bed	5	1.44	-	Italian
Le patate vengono dall'America	The potatoes come from America	4	1.792	-	Italian
In primavera sbocciano i fiori	In spring the flowers bloom	5	1.792	-	Italian
Le rane cantano di notte	Frogs sing at night	5	1.524	-	Italian
Nella stanza ci sono cinque sedie	There are five chairs in the room	6	1.818	-	Italian
Le radici dell'albero arrivano in strada	The tree roots reach the street	6	1.89	-	Italian
El pan fresco l'è finìo	Fresh bread is finished	5	1.694	-	Venetian
el butin sona el pifaro	The child plays the flute	5	1.922	-	Venetian
tegno i libri nell'armaro	I keep the books in the closet	4	1.589	-	Venetian
Gò tajà le rame del peraro	I cut the branches of the pear tree	6	2.302	-	Venetian
La fogassa l'è insima alla tola	The focaccia is on the table	6	2.292	-	Venetian
Quela casa la ga la porta rossa	That house has a red door	7	2.506	-	Venetian
D'inverno el sol va zó bonora	The soup was without salt	6	1.901	-	Venetian
i cani bajava al postin	This cap is too tight	5	1.457	-	Venetian
L'albaro ga fato un pesto de naranse	The teacher teaches	7	2.26	-	Venetian
El vaso el sa roto in mile tochi	The wool sweater is warm	8	1.901	-	Venetian
La candela la sa smorsà	On the ground it is full of crumbs	5	1.689	-	Venetian
Ieri pioveva, ancó névega	The roof has broken tiles	4	1.943	-	Venetian
La minestra lèra dessavìa	In winter the sun goes down quickly	4	1.557	-	Venetian
Sta bareta l'è massa streta	The dogs barked at the postman	5	1.748	-	Venetian
la maestra la fa lesion	The tree made a lot of oranges	5	1.361	-	Venetian

El majon de lana l'è caldo	The vase broke into many pieces	6	1.442	-	Venetian
Par tera ghe pien de fregole	The candle went out	6	1.357	-	Venetian
Ghè copi roti insima al querto	Yesterday it was raining. today it is snowing	6	1.604	-	Venetian
La querta l'è sul leto	The blanket is on the bed	5	1.634	-	Venetian
Le patate vien daa Amèrica	The potatoes come from America	5	2.137	-	Venetian
In primavera sbòcia i fiori	In spring the flowers bloom	5	2.187	-	Venetian
le rane le canta de note	Frogs sing at night	6	2.162	-	Venetian
Nee camara ghe sinque careghe	There are five chairs in the room	5	2.489	-	Venetian
Le raixe del albaro ie rivà in strada	The tree roots reach the street	8	2.79	-	Venetian
El informe no está completo	The report is not complete	5	1.708	23	Spanish
El libro tiene cien páginas	The book has a hundred pages	5	1.855	23	Spanish
El ordenador es muy caro	The computer is very expensive	5	1.526	20	Spanish
Hoy abrirán las tiendas	Stores will open today	4	1.959	19	Spanish
La casa tiene dos plantas	The house has two floors	5	1.776	21	Spanish
El suelo está mojado	The floor is wet	4	1.62	17	Spanish
El coche es muy espacioso	The car is very spacious	5	1.646	21	Spanish
Dan los dibujos por la tele	They give the drawings on TV	6	1.658	22	Spanish
El batido es de fresa y plátano	The smoothie is strawberry and banana	7	2.116	25	Spanish
El casco es rojo y negro	The helmet is red and black	6	1.805	19	Spanish
El cielo está nublado	The sky is cloudy	4	1.829	18	Spanish
El cinturón es muy ancho	The belt is very wide	5	2.038	19	Spanish
La silla se ha roto	The chair has been broken	5	1.568	13	Spanish
El diccionario es grueso	The dictionary is thick	4	2.064	21	Spanish

El móvil se cayó al suelo	The mobile fell to the ground	6	2.011	20	Spanish
El gimnasio está vacío	The gym is empty	4	1.887	19	Spanish
El molino dejó de funcionar	The mill stopped working	5	2.168	23	Spanish
El sobre es muy pequeño	The envelope is very small	5	1.933	18	Spanish
La libreta es lila	The notebook is lilac	4	2.194	15	Spanish
El dado tiene seis caras	The die has six faces	5	2.247	20	Spanish
La tienda se queda vacía	The store is empty	5	1.645	19	Spanish
La toalla es muy suave	The towel is very soft	5	1.933	17	Spanish
Las fresas son sabrosas	Strawberries are tasty	4	2.482	20	Spanish
Tiene chocolate negro	Has dark chocolate	3	2.273	18	Spanish
Txostena osatu gabe dago	The report is not complete	4	2.19	20	Basque
Liburuak ehun orrialde ditu	The book has a hundred pages	4	2.184	22	Basque
Ordenagailua oso garestia da	The computer is very expensive	4	2.29	25	Basque
Gaur dendek irekiko dute	Stores will open today	4	2.221	21	Basque
Etxeak bi solairu dauzka	The house has two floors	4	2.498	20	Basque
Lurra bustita dago	The floor is wet	3	1.518	16	Basque
Kotxea oso handia da	The car is very spacious	4	1.261	15	Basque
Telebistan marrazkiak ematen dituzte	They give the drawings on TV	4	2.152	32	Basque
Edaria marrubi eta platanozkoa da	The smoothie is strawberry and banana	5	2.067	28	Basque
Kaskoa gorria eta beltza da	The helmet is red and black	5	1.553	21	Basque
Zerua erabat estalita dago	The sky is cloudy	4	1.825	23	Basque
Gerrikoa oso zabala da	The belt is very wide	4	1.582	18	Basque
Aulkia hautsi da	The chair has been broken	3	1.055	12	Basque
Hiztegia oso mardula da	The dictionary is thick	4	1.731	19	Basque

Mugikorra lurrera erori zen	The mobile fell to the ground	4	1.787	22	Basque
Gimnasioa hutsik dago	The gym is empty	3	1.481	17	Basque
Errota zaharra ez dabil	The mill stopped working	4	1.599	17	Basque
Gutunazala oso txikia da	The envelope is very small	4	1.912	20	Basque
Koadernoa morea da	The notebook is lilac	3	1.638	16	Basque
Dadoak sei alde ditu	The die has six faces	4	1.758	17	Basque
Denda hutsik geratu da	The store is empty	4	1.793	17	Basque
Izarak oso finak dira	The towel is very soft	4	2.146	18	Basque
Marrubiak gozo-gozoak dira	Strawberries are tasty	3	2.126	22	Basque
Honek txokolate beltza dauka	Has dark chocolate	4	1.893	22	Basque

Chapter 3 | Language categorization and social attention

Lorenzoni, A., Calignano, G., Dalmaso, M., & Navarrete, E. (under review). Linguistic identity as modulator of gaze-cueing of attention. Scientific Reports.

3.1. Introduction

Individuals tend to orient their own attentional resources towards the same spatial location indicated by others (Emery, 2000). This phenomenon, known as social attention, is a central ability, as it allows individuals to create meaningful social relationships and efficiently share attention towards a specific object or event occurring in the environment (e.g., Capozzi & Ristic, 2018). An increasing number of studies has shown that eye-gaze direction is an effective cue of social attention, which provides a clear and easily accessible source of information about where another individual is attending (see for instance, Frischen et al., 2007; McKay et al., 2021; Shepherd, 2010; for reviews). This ability is considered to play a crucial role in social cognition (Baron-Cohen, 1995).

A standard method to study gaze-mediated orienting of attention is through the so-called gaze-cueing task (e.g., Driver et al., 1999; Friesen & Kingtsone, 1998). In this task, participants are typically presented with a central face with a direct gaze, and then with a picture of the same face with an averted gaze. Then, a peripheral target appears, requiring a manual response. In the so-called congruent condition, the target appears in the same spatial location indicated by gaze, whereas, in the incongruent condition, the target appears elsewhere. The classical results show that, even though the gaze direction is not informative on the location of the upcoming target, participants are faster and more accurate on congruent trials than on incongruent trials. This finding is interpreted to reflect an attentional shift in the direction signalled by the gaze (e.g., Driver et al., 1999; Friesen & Kingtsone, 1998).

Early studies considered the gaze-cueing effect a reflexive phenomenon, as it occurs even when the observer is not motivated to shift attention towards the direction cued by the gaze (Driver et al., 1999), such as when gaze direction is counter-informative (i.e., targets are more likely to appear on the opposite side as that indicated by the gaze). However, more recent studies demonstrated that several social variables can modulate the gaze-cueing effect (for a recent review, see Dalmaso et al., 2020). Indeed, in everyday life, we constantly interact with or are exposed to different people who may come from the same vs. different social environments as ours and who share the same vs. different social characteristics as ourselves. Information about age, gender, and ethnicity is automatically and rapidly extracted when we look at the face of a person (Quinn et al., 2002; Weisman et al., 2015). Critically, this information contributes to categorize individuals, and it allows us to organize, structure, and process stimuli (e.g., faces) of our environment in a rapid and efficient manner (Bornstein, 1979; Bornstein & Korda, 1984; Liberman et al., 1957). Such a process of categorizing individuals (or faces) is known as social categorization. As already mentioned, previous studies showed that social information extracted from a face stimulus can shape the gaze-cueing effect. For example, a larger gaze-cueing effect has been reported for familiar faces over unfamiliar faces (e.g., Deaner et al., 2007), for trustworthy faces over untrustworthy faces (e.g., Sußenbach and Schonbrodt, 2014), and for faces described as belonging to high-status individuals rather than low-status individuals (e.g., Dalmaso et al., 2012; 2014). Furthermore, there is evidence that group membership can also shape the gaze-cueing effect. For instance, Pavan et al. (2011) employed a gaze-cueing task in which White and Black faces were presented to White Italian and Black African participants living in Italy. The results showed that White participants exhibited a reliable gaze-cueing effect only in response to White faces. On the contrary, Black participants showed a reliable gaze-cueing effect regardless of the ethnicity of the cueing face (see also Dalmaso et al., 2015; Weisbuch et al., 2017). Interestingly

for our purposes here, the study by Pavan and colleagues suggests that group membership and social status moderate the gaze-cueing effect. Indeed, as the authors pointed out, a possible explanation for these results could be derived by differences in social status attributed to the two groups: in Italy, White individuals are a majority and likely belong to higher status groups, while Black individuals are a minority and belong to a lower status group, respectively (see also Zhang et al., 2021). Together, all these findings seem to confirm the important role of social factors in shaping gaze-mediated orienting of attention.

Recently, researchers have started to pay attention to a new dimension that may affect social categorization, that is, the language used by the interlocutor. Analogously to what has been observed with other cues, such as race and gender (Quinn et al., 2002; Weisman et al., 2015), recent research has shown that individuals categorize others according to the language (or accent) they speak. This categorization appears to emerge in the first years of life, as evidenced by the observation that 6-month-old infants prefer looking at speakers of their same native language than those who speak a different language (Kinzler, Dupoux, & Spelke, 2007). Other studies reported that 11- and 19-month-old infants, when learning new information, look more frequently at members belonging to the same linguistic group than at people of a different linguistic group (Begus et al., 2016; Howard et al., 2014; Liberman et al., 2017). With adult participants, research has shown that the language associated with a specific face stimulus is used to implicitly categorize individuals (Baus et al., 2021; Champoux-Larsson et al., 2021; Lorenzoni et al., 2022; Pietraszewski & Schwartz, 2014).

In addition to what described above, empirical investigations on the role of language as a cue for categorization in adults have focused on the logic underlying the memory confusion paradigm (MCP; Klauer & Wegener, 1998; Taylor et al., 1978). The MCP is a standard way to implicitly measure social categorization, while removing social desirability effects (Kurzban et al., 2001; Susskind, 2007; Taylor et al., 1978). The logic of the paradigm is that if a particular

feature – such as language – is a cue that triggers categorization, then people who share the same dimension should be more confused with each other during a memory task. That is, when trying to recall specific information, memories of people who share the same language are more likely to be confused with each other, even in the absence of conscious awareness that this is happening. In this sense, patterns of memory confusion reveal fundamental categorization processes. The paradigm is traditionally divided into three sessions: familiarization, distractor task, and recognition. In the familiarization session, participants are exposed to pairings of faces and statements. Participants are simply told to make impressions of each person as they make each statement. Then, the distractor task is designed to prevent participants from explicitly thinking about the speakers and statements they had just seen. Finally, in the recognition session, participants see all the faces they had seen previously and are asked to try to remember which statement came from which speaker (i.e., "Who said what?"). Unbeknownst to participants, errors in the recognition phase reveal non-conscious categorization processes. For instance, if a participant categorizes speakers by their language during the initial familiarization session, then during the recognition session they will be more likely to misattribute the statement to someone else who also spoke the same language as the original speaker, as opposed to someone who spoke in a different language. Using this paradigm, recent evidence has shown that categorization based on language (or accent) is an implicit and automatic process (Baus et al., 2017; Baus et al., 2021; Champoux-Larsson et al., 2021; Lorenzoni et al., 2022; Pietraszewski & Schwartz, 2014a; 2014b). In sum, we orient attention in response to an eye-gaze direction of a face; at the same time, we categorize our interlocutors based on the language they speak. The aim of the present paper was to investigate whether these two processes interact.

In the present study, our objective was to investigate the role of language in guiding social attention. In particular, we explored whether the gaze-cueing effect was modulated by

the linguistic identity associated with facial stimuli. To this end, we employed a gaze-cueing paradigm (e.g., Driver et al., 1999) and manipulated the linguistic identity of the cueing faces through a preliminary familiarization phase. In doing so, we wanted to shed fresh light on the top-down mechanisms influencing social attention by adding to this debate one of the critical abilities of humans, that is, language. To ensure that faces were categorized according to language, we implemented the memory confusion paradigm by adapting it to the contest of the gaze-cueing paradigm.

Two Studies were conducted. In both Studies, Italian native participants were first familiarized with 8 faces by hearing sentences associated with them; half of the faces were associated with Italian (native language) and the other half with an unknown, foreign, language (Albanian and Basque, in Study 3 and 4, respectively). Then, in a gaze-cueing task, the faces were used as task-irrelevant cueing stimuli. Participants were instructed to detect a target located in congruent or incongruent positions according to the direction of the gaze. Finally, all faces were presented along with the same sentences in a recognition phase. Overall, faster manual responses were expected in congruent trials than in incongruent trials, thus confirming the presence of a reliable gaze-cueing effect. Critically, if the gaze-cueing effect is modulated by the linguistic identity associated with facial stimuli, we expect an interaction between the gaze-cueing effect and language faces.

According to the literature on gaze cueing (e.g., Dalmaso et al., 2020), we believe that two alternative interpretations can be advanced for the possible interaction. One interpretation relies on the in-group vs. out-group distinction. In this regard, the respective membership of the face can shape the gaze-cueing effect depending on whether it belongs to the same group (in-group) or not (out-group) than the participant (see, e.g., Liuzza et al., 2011). In the context of this study, Italian participants may classify as in-group those faces that were associated with Italian sentences and as out-group those faces associated with the foreign language (Albanian

and Basque). According to this scenario, a larger gaze-cueing effect is expected with in-group face stimuli, as was in the case in the study by Liuzza et al. (2011). At the same time, differences on the gaze-cueing effect when comparing two different social groups could be ascribed to asymmetries in their social status. Participants have been shown to shift attention more strongly in response to the averted gaze of a face that was described as depicting a high-status individual (Dalmaso et al., 2012, 2014; Pavan et al., 2011; Zhang et al., 2021). Thus, the status of the faces in our experiment can depend on the social status attributed to the two foreign languages by our Italian participants. In Italy, Albanian individuals represent a minority group and are often perceived as lower in social status than Italian individuals (Aquino et al., 2015). Basque, by contrast, is a language spoken mostly in Spain (see below) and the Italian population has probably little or no experience with the Basque speakers. More importantly, there is no a priori reason to expect Basque speakers to be considered as lower in status individuals compared to Italian speakers. To control for the role of status on the possible interaction between language and gaze-cueing effect, our participants completed the MacArthur Scale of Subjective Social Status after the main gaze-cueing task.

3.2. Study 3: Italian and Albanian languages

Materials and methods

Participants. Forty-eight Italian native speakers (24 females, mean age in years = 25.75, SD = 5.01) were recruited through the Prolific crowdsourcing platform (Palan & Schitter, 2018). The test was administered online and anonymously using Labvanced software (Holger et al., 2016). The inclusion criteria for all participants were: having Italian as a native language, having no knowledge of Albanian and Basque, being in good health and having no sensory or neurological disorders. The sample size was fixed to forty-eight participants according to the indication that, in a regression analysis (see the results section), increasing 5-10 observations per variable is likely to give at least an acceptable estimation of regression coefficients, standard errors, and confidence intervals (Bentler & Chou, 1987; see also Bollen, 1989; Hanley, 2016; Knofczynski & Mundfrom, 2008). In particular, the total number of observations in generalised linear mixed-effects models refers to both the number of participants and the number of observations nested within each participant per variable (Bates et al., 2015). The research protocol was approved by the Ethics Committee of the Department of Developmental Psychology and Socialization, University of Padova (protocol number: 4505). All data is available under the following OSF repository: https://osf.io/zcrvg/?view_only=41ec250d2b1f43afbeecc0aa7f2c5e02.

Materials. Eight full-colour photos of adult males with neutral expression were used as stimuli and were taken from the MR2 Face Database (Strohminger et al., 2016). Photographs were divided into two sets. Within each set of four photos, photographs of faces were controlled for Attractiveness, Mood, Trustworthiness, Masculinity and Age (all *ps* > .61). These images were then edited to remove the grey background and edit the direction of eye-gaze to create three versions of each face: straight, left, and right gaze. These stimuli were effective in

eliciting a reliable gaze-cueing effect in previous studies (e.g., Strachan et al., 2017; Dalmaso et al., 2021).

In addition, twenty-four non-autobiographical sentences were created. Half of them were recorded in Italian (native language) and the other half in Albanian (foreign language) using the software Audacity (v 2.0.3; https://www.audacityteam.org/). The recording durations of sentences in Italian [mean = 1.98 seconds, range = 1.79-2.42] and Albanian [mean = 2.22 seconds, range = 1.63-3.12] did not differ ($t(22) = -1.57$, $p = .13$). To avoid any possible mismatch between face and voice, Italian and Albanian young adults, of similar age of the faces, were selected to record the sentences. In particular, four male native Italian speakers and four male native Albanian speakers recorded three sentences each. The final design consisted of photographs of faces accompanied by a voice speaking Italian or Albanian. Four lists were created to counterbalance face and language stimuli.

Procedure. **Gaze-cueing and MCP tasks**. The experiment consisted of three sessions: the encoding session, the gaze-cueing task, and the recognition session (see also Figure 1). At the beginning of the experiment, to avoid the interference of any sort of expectation and to preserve the implicit nature of the paradigms, the participant was only aware of the first session (i.e., the encoding session) and was informed that the study took approximately 25 minutes. Moreover, they were also informed about the nature of the two languages used in the experiment (i.e., Italian and Albanian). In the encoding phase, facial stimuli were presented on the screen one at a time along with the auditory presentation of the sentences. Participants only had to form impressions about the speakers as they watched and listened. The trial structure was the following: one photo and one audio were presented simultaneously. The photo of each speaker was displayed, centrally, for the duration of the statement, plus about two additional seconds thereafter, followed by a blank screen for 1200 ms. Each of the eight faces was

presented three times during the encoding phase, for a total of 24 presentations. Additionally, each face was paired with a specific voice and associated with three different sentences spoken by that voice.

Upon completion of the encoding phase, participants were engaged in the gaze-cueing task in which the same eight faces were used as cueing faces. Each trial began with the presentation of a white fixation cross in the centre of the screen for 900 ms (fixation frame, Figure 1), followed by a central face with direct gaze (face frame, 500 × 500 pixels). After 900 ms, the same face appeared with an averted gaze (cue frame). This photograph was obtained by moving the irises 0.25° to the right or to the left from the original central position using GIMP (v. 2.6). After 200 ms, a black line (horizontal or vertical, 0.82°) appeared 11° to the left or right of the centre of the screen in one of two possible locations: spatially congruent or incongruent with gaze direction. The target frame remained visible until a response was provided or for a maximum of 1500 ms, whichever came first. Participants were instructed that the direction of gaze was not informative in relation to the target location, and they were also asked to maintain fixation at the centre of the screen for the duration of the trial. The instructions emphasised both the response speed and the accuracy. The participants responded using their right and left index fingers. Half of the participants were instructed to press the ‘K’ key on the keyboard if the target line was 'vertical' and the ‘F’ key if the target line was ‘horizontal’. The remaining participants responded using the opposite mapping. In case of a wrong or a missed response, a visual feedback (the words “ERROR” or “TOO SLOW”, respectively; Arial font) was provided at the centre of the screen for 500 ms. There were 64 trials for each condition defined by the spatial congruency between gaze direction and target location (congruent versus incongruent) and language (foreign versus native), for a total of 256 trials presented in random order. Literature on gaze-cueing suggests that to observe an influence on gaze-cueing of social variables that are arbitrarily associated with different facial

identity, it can be necessary to reinforce that association through repeated exposure (see also Carraro et al., 2017; Dalmaso et al., 2014). Consequently, we decided to repeat twice the encoding phase (and, consequently, the gaze-cueing phases) to strengthen the association between language and facial stimuli. Thus, the gaze cueing task was composed of two blocks (512 trials in total).

After the second gaze-cueing block, participants started the recognition phase, where all 8 photographs were presented on the screen, numbered from 1 to 8. Face order was randomized among participants and trials. Then, the same 24 sentences from the encoding phase were presented again in auditory form. The participant decided which of the eight faces accompanied the sentence in the encoding phase by clicking on the keyboard the corresponding number. The eight faces remained on the screen until the participant's response, after which a blank of 1000 ms was presented. The procedure continued until all 24 sentences in the encoding phase were presented.

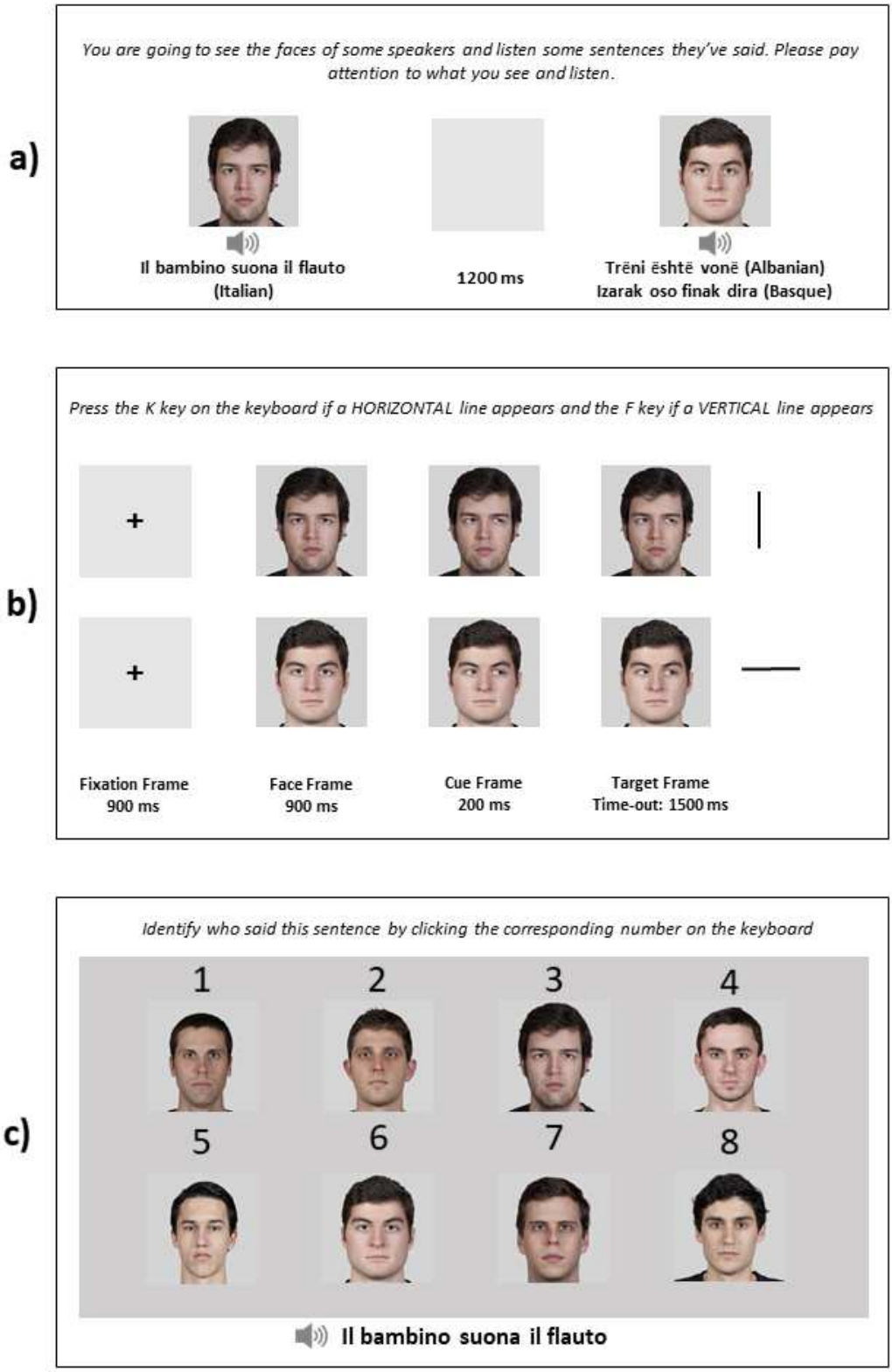


Figure 1. Illustration of stimuli (not drawn to scale) and sequence of events together with the given instruction to participants for: a) familiarization phase; b) gaze-cueing task and c) recognition session.

MacArthur Scale of Subjective Social Status. To capture the possible role of social status associated with the languages used in our two Studies, we asked our participants to rate the social status associated with the languages. Participants were contacted 15 days after the main experiment to fill out the MacArthur Scale of Subjective Social Status (MacArthur SSS Scale; Adler et al., 2000; Goodman et al., 2001; Ostrove et al., 2000; Singh-Manoux et al., 2003), which provides a single item measure of the perceived social status of social linguistic groups. Participants were contacted 15 days after they had performed the main experiment to exclude any spurious effect of facial stimuli during the ratings. Participants in Study 3 and in Study 4 rated the social status of the three languages used in the main test, that is, Italian, Albanian and Basque. The task was the following: Firstly, participants listened to four neutral sentences for each language, for a total of 12 sentences. These sentences were different from the experimental sentences used in the main experiments. Together with the sentences, the corresponding flag of the language was presented, that is, the flag of Italy, Albania, or the Basque Country. No faces were presented together with the sentences. Then, participants completed the MacArthur Subjective Social Status Scale for each language. Participants viewed a drawing of a ladder with 10 rungs together with the flag of the language and read that the ladder represented where people stand in society. More precisely, participants were provided with the following information: "At the top of the ladder are the people who are the best off, those who have the most money, most education, and best jobs. At the bottom are the people who are the worst off, those who have the least money, least education, worst jobs, or no job. Please place an 'X' on the rung that best represents where you think you stand on the ladder".

Analysis. **Gaze-cueing task.** We considered as experimental factors Gaze (Congruent vs. Incongruent), Language (Native vs. Foreign) and Block (First vs. Second). Block was added

to consider possible learning effects in gaze cueing (see also Carraro et al., 2017; Dalmaso et al., 2014). Data from the gaze-cueing task were analysed using generalised mixed-effects models (GMMs - Bates, Kliegl, Vasishth, & Baayen, 2015). GMMs are an extension of the general linear models (GLMs) that allow one to specify the distribution family. Since residuals are often positively skewed and heteroscedastic when dealing with nonnegative behavioural data (as, e.g., response time and accuracy), these models are preferred to the classical ANOVAs (Baayen, Davidson, & Bates, 2008). The GMMs approach allows modelling data for random and fixed effects. Moreover, those methods fit with multiple, crossed grouping factors and, possibly unbalanced data sets by stabilising the estimation of parameters (Baayen et al., 2008; Bates, 2010). To find the best approximation to the true model, we followed a model comparison approach with AIC (Akaike Information Criterion) and AIC weight as goodness-of-fit indexes. The AIC and AIC weight compare all the models at once and give information on a model's relative evidence (i.e., likelihood and parsimony), so that the model with the lowest differential AIC and the highest AIC weight is to be preferred (Wagenmakers & Farrell, 2004). We started from the simplest model with only random factors (participants and faces) and proceeded by adding predictors and, specifically, by weighting the effects of the main manipulations. To explore whether experimental manipulations statistically influenced response time, we visually inspected the model estimates of differences between conditions. We excluded anticipatory responses (<100ms) and included response times up to 1000ms (1.72% of the trials were removed). Error trials (5.24%) were excluded from the response times (RTs) analysis and analysed separately. All data and analysis are openly available in the repository OSF link.

Recognition task. Following previous studies that have used this paradigm (Baus et al., 2017; Baus et al., 2021; Champoux-Larsson et al., 2021; Lorenzoni et al., 2022; Pietraszewski & Schwartz, 2014a, 2014b), to test for the presence of a language effect,

categorization was measured on a participant basis by calculating the difference in error rates between same-language errors and different-language errors. While there are only three possibilities to make same-language errors (because one of the faces is the correct answer), there are four possibilities to make a different-language error. To correct for this discrepancy, the number of different-language errors was multiplied by 0.75. Paired t-test analyses were performed between same-language and different-language errors (see Pietraszewski, 2018, for validation of this method).

MacArthur Scale of Subjective Social Status. Linear mixed-effects regressions were performed on the ratings using the lme4 package (Bates et al., 2015). In the mixed model, the factor "Language" was introduced as fixed effect, and Participant as random effect. We compared this model with a null model with only Participant as random effect.

Results. ***RTs Gaze-cueing task.*** The model of interest with the triple interaction between Gaze (Congruent vs. Incongruent), Language (Native vs. Foreign) and Block (1 vs.2) was the most plausible predicting response times (b = -17.17, SE = 8.09, t = -2.12). In particular, the results from Block 1 showed a significant effect of cue-target congruency both for native (b = -12.1, SE = 4.19, t = -2.88) and foreign faces (b = -17.3, SE = 4.15, t = -4.17). However, for Block 2, this was true only when native faces (b = -18, SE = 3.9, t = -4.60) were presented (for foreign faces: b = -6.1, SE = 3.92, t = -1.56). Results from Block 2 revealed that participants shifted their attention in response to the averted gaze of native faces, but not in response to the averted gaze of foreign faces. See Figure 2[1].

[1] To see if the social status attributes to the languages interacts with language and gaze cueing, we add to the main model the mean social status attribute to Albanian and Italian languages by participants. Even if the social status indices do not influence our effect of interest, the results show an increase in reaction times with increasing status judgment for the Albanian language (b = 21.20, SE = 3.46, t = 6.13).

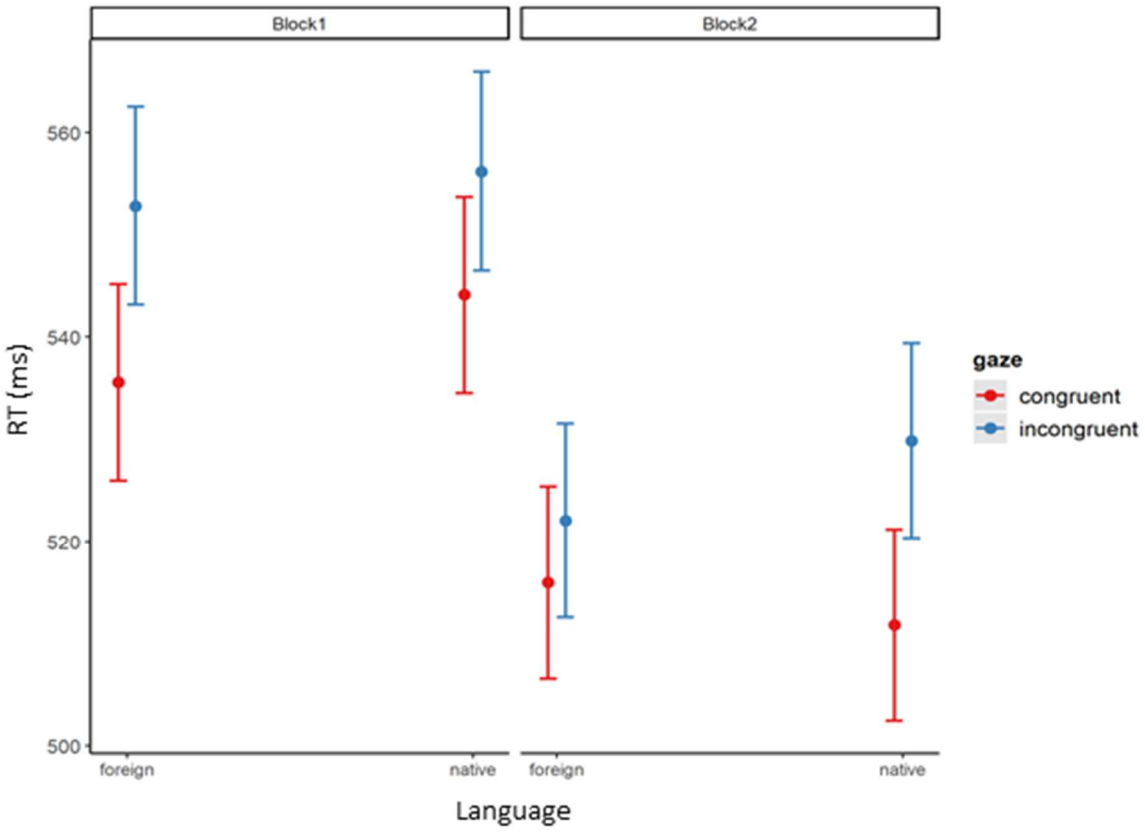


Figure 2. Marginal effects of interaction terms of the selected model for target detection time in milliseconds. The gaze cueing effect was presented in the two blocks with native language faces, but it was absent in the second block with foreign faces.

Accuracy Gaze-cueing task. The model with Gaze (Congruent vs. Incongruent), Language (Native vs. Foreign) and Block (1 vs.2) was the most plausible predicting accuracy responses. Incongruent cues predicted a less accurate response compared to the Congruent cues (b = -.22, SE = .08, t = -2.77). The results also show a significant effect of Block predicting a more accurate response for Block 2 than for Block 1 (b = .17, SE = .08, t = 2.20).

Recognition Task. The paired t-test showed that participants made significantly more same-language errors (11.23, SD = 3.58) than different-language errors (1.97, SD = 2.85, t(47) = 12.45, p < .001). See Figure 3.

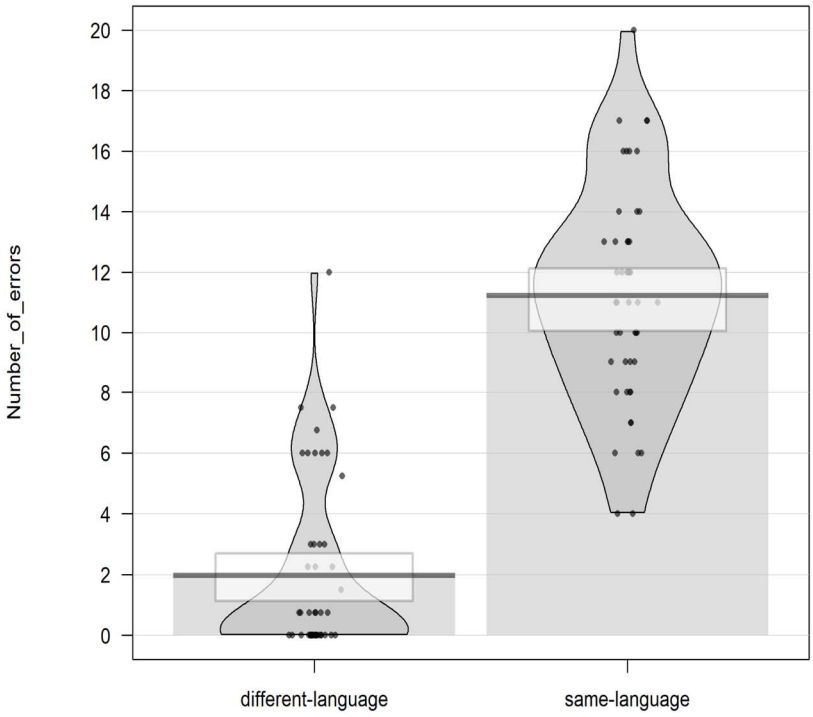


Figure 3. Mean of errors split by type of error for Study 3.

MacArthur of Subjective Social Status Scale. Results showed that Albanian was judged the language with the lowest status (M=5.21; SD=1.72), compared to both Basque (M=6.19; SD=1.08; *b* =-0.97, SE = .20, *t*=-4.78) and Italian (M=6.80; SD=1.03; *b* = -1.58 SE = .20, *t*=-7.77) languages. Basque was judged with lower status than Italian (*b* = -0.61, SE = .17, t=-3.65)

Discussion. Two main findings emerged from this study. First, the results of the recognition task revealed that participants categorized faces based on the language they were associated with, thus replicating recent findings on the role of language as a cue for social categorization (Baus et al., 2021; Champoux-Larrson et al., 2021; Lorenzoni et al., 2022). Second, and more importantly here, the results from the gaze-cueing task revealed that the

language associated with facial stimuli shaped the magnitude of the gaze-cueing effect. In particular, we obtained evidence showing that the gaze-cueing effect for facial stimuli associated with the foreign language was abolished. This is in line with our hypothesis based on in-group vs. out-group distinction (e.g., Liuzza et al., 2011) and, more generally, with the idea that people would be more inclined to prefer and prioritise own-language speakers than foreign language speakers (Dewaele & McCloskey, 2015; Fraser & Kelly, 2012; Fuertes et al., 2012; Giles & Watson, 2013; Gluszek & Dovidio, 2010). The modulatory role of language on gaze-cueing reported in Study 3 was detected only in the second block, namely after participants completed two learning phases aimed at associating a given language with a specific face identity. This seems to confirm that this association would require to be reiterated to fully emerge and be detectable at the attentional level, which is in line with some previous works on gaze-cueing (see Carraro et al., 2017; Dalmaso et al., 2014). Finally, results from the MacArthur Social scale, Albanian was judged with lower status scores compared to Italian (and Basque). This latter evidence suggests that our results can be also interpreted in terms of differences in social status (see also, e.g., Dalmaso et al., 2012, 2014).

In the next Study, we wanted to extend and clarify the results observed in Study 3 with a different pair of languages: Italian (native language) and Basque (foreign language). The Basque language is spoken by individuals living in the Basque Autonomous Community and Navarra in north-eastern Spain and in some areas in south-western France. According to our original prediction, participants in Study 3 judged Albanian language as the lowest in social status. However, they also judged Basque language as slightly lower in status than Italian language, which was unexpected. We tested the robustness and reliability of these results by administering the MacArthur Scale also to the new pool of Italian participants of Study 4. In relation to the gaze-cueing task, if the results observed in Study 3 were driven by an own-language vs. foreign language distinction, that is, an in-group/out-group distinction, a similar

modulation on the gaze-cueing effect should have emerged in Study 4 (i.e., an abolished gaze-cueing effect, in the second block, for the faces associated with the Basque language). Otherwise, if the results observed in Study 3 were driven by differences in social status between the two linguistic groups, a different scenario could emerge in Study 4, according to the results provided by the MacArthur Scale. If the status associated with the Basque language was perceived, again, as closer to the status of Italian as compared to the status of Albanian, then the gaze-cueing effect for the faces associated with Basque could be just reduced (or even be unaffected, if the difference in status was too small to detect an effect at the attentional level) in the second block, and not abolished as for the faces associated with the Albanian language (Study 3).

3.3. Study 4: Italian and Basque languages

Materials and methods

Participants. The sample size was identical to that used for Study 3. Hence, forty-eight adults (24 females, mean age in years = 25.70, SD = 4.75) were also recruited and tested in this second experiment. Participants come from the same Italian pool of participants of Study 3 and were recruited through the Prolific crowdsourcing platform. The same inclusion criteria as in Study 3 were applied in Study 4. None of the participants involved in Study 3 took part in Study 4.

Materials. Everything was identical to Study 3, with the following exception: the sentences in Albanian language were replaced by twelve sentences recorded by four male native Basque speakers, which therefore became the foreign language. Recording durations of sentences in Italian [mean = 1.98 seconds, range = 1.79-2.42] and Basque [mean = 2.01 seconds, range = 1.60-2.29] did not differ ($t(22) = 0.37$, $p = .71$). The final design consisted of photographs of faces accompanied by a voice speaking either Italian or Basque.

Procedure. Everything was identical to Study 3.

Analysis. Everything was identical to Study 3. As for the gaze-cueing task, we excluded anticipatory responses (<100ms) and included response times up to 1000ms (1.79% of the trials were removed). Error trials (6.17%) were removed and analysed separately.

Results. **RTs Gaze-cueing task.** The model with Gaze (Congruent vs. Incongruent), Language (Native vs Foreign) and Block (1 and 2) was the most plausible predicting response time. Incongruent cues predicted a slower response compared to the Congruent cues (b = -13.26, SE = 2.02, t = -6.57). The results also show a significant effect of Block predicting faster

response time for block 1 than for block 2 (b = -12.22, SE = 2.02, t = -6.05). Figure 4 shows the differential effect plot for each of the three factors[2].

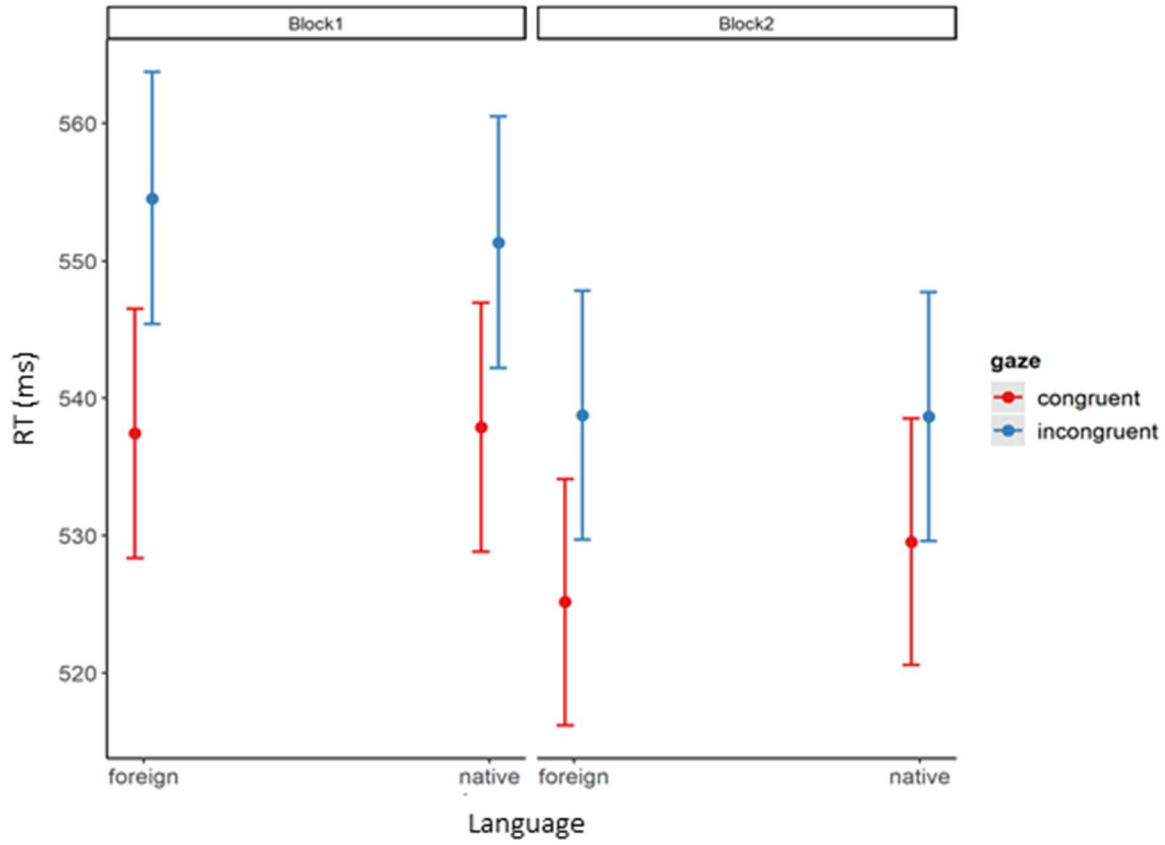


Figure 4. Marginal effects for target detection time in milliseconds. The gaze cueing effect was similar in both blocks and with the foreign and native languages.

Accuracy Gaze-cueing task. The model comparison revealed that the best model is the null model. Neither the gaze effect (b = -.09, SE = .07, t = -1.24) nor the language effect (b = .03, SE = .075, t = .42) were significant.

[2] To see if the social status attributes to the languages interacts with language and gaze cueing, we add to the main model the mean social status attribute to Basque and Italian languages by participants. Even if the social status indices do not influence our effect of interest, the results show an increase in reaction times with increasing status judgment for the Italian language (b = 11.10, SE = 3.21, t = 3.46).

Recognition Task. The paired t-test showed that participants made significantly more same-language errors (10.06, SD = 2.73) than different-language errors (2.58, SD = 3.46, $t(47) = 12.05$, $p < .001$). See Figure 5.

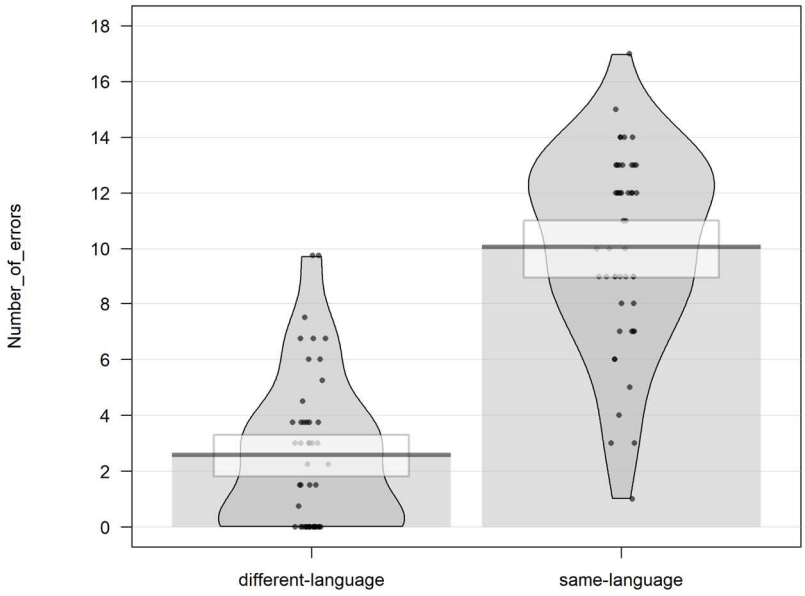


Figure 5. Mean of errors split by type of error for Study 4.

MacArthur Scale. Results showed that Albanian was judged the language with the lowest status (M=5.53; SD=1.63), compared to both Basque (M=6.29; SD=1.08; $b = .75$, SE = .25, t=3.06) and Italian (M=7.09; SD=1.26; $b = 1.55$ SE = .24, t=6.31) languages. Basque was judged with lower status than Italian ($b = .80$, SE = .21, t=3.77).

Discussion. The results of the recognition task revealed that participants categorized faces based on the language they were associated with, replicating Study 3. In addition, as in Study 3, participants judged Italian as the language with higher status, followed by Basque and then Albanian. However, gaze-cueing of attention was not modulated by language identity, indicating that faces associated with Italian and Basque language had a similar effect at the attentional level. In the further section we discuss possible explanations for these results.

3.4. General Discussion

The purpose of the present study was to investigate the possible role of language in shaping social attention. In particular, we explored whether the gaze-cueing effect was modulated by the linguistic identity associated with facial stimuli. In two Studies, we employed a gaze-cueing paradigm and manipulated the linguistic identity of the cueing faces through a preliminary familiarization phase in which participants listen to sentences of different languages and, at the same time, they also saw the faces of possible speakers. In the two Studies, faces could be associated with the native language of the participants (i.e., Italian) or with a foreign and unknown language (i.e., Albanian in Study 3, and Basque in Study 4). Faces associated with the foreign language did not elicit a gaze-cueing effect, as compared to the faces associated with the native language, in Study 3 alone. In Study 4, in contrast, no differences in the gaze-cueing effect emerged between the two groups of faces. In addition, at the end of the gaze-cueing task, participants were instructed to identify which face was associated with each sentence using the memory confusion paradigm. Results from both Studies revealed that participants implicitly categorized the faces based on the language they were associated with in the familiarization phase. Overall, these results confirmed and extended the knowledge on the role of linguistic identity in shaping both mnestic and attentional mechanisms.

The novel result emerging from this work was that gaze-cueing of attention was likely modulated by the linguistic identity in Study 3, suggesting that linguistic identity is a critical cue during social attention. To our knowledge, this is the first evidence that implicit linguistic categorization affects social attention. The interaction between linguistic identity and gaze-cueing was absent in Study 4. That is, a plausible explanation for the different pattern found in the two Studies may also be explained by the lower social status attributed to Albanian (Study 3) individuals compared to Basque individuals (Study 4). This difference appeared to be

confirmed by the self-report measures we collected from our samples, showing that the social status of Albanians was perceived as lower than the social status of Basques and Italians (see also, Aquino et al., 2015). Although Basque was also perceived to be lower in social status compared to Italian, no interaction between language and gaze-cueing emerged in Study 4. We argued that this could be due to the fact that the difference was not enough to modulate gaze-cueing. In fact, when the two experiments were carried out, the difference in social status between Italian and Basque was half (.71) than the difference between Italian and Albanian (1.57).

It is well-known that humans are particularly sensitive to social hierarchies (see, e.g., Mattan et al., 2017), likely because high-status individuals are perceived to be considered as more relevant sources of information when compared with low-status individuals. According to this notion, it has been indicated that people tend to look at high-status individuals more often and for longer than at low-status individuals (Foulsham et al., 2010), and also that gaze-cueing of attention is magnified when elicited by faces associated with high status than low status (Dalmaso et al., 2012, 2014; Zhang et al., 2021). Therefore, in the present context, it seems reasonable to assume that the different social status associated with Albanian and Basque individuals may have influenced the attentional response to eye-gaze stimuli provided by the groups of faces. Critically, eye-gaze stimuli in our Studies affected participants differently based on the implicit categorization that they made during the familiarization task, given that all other conditions were identical in both studies.

Conclusion. To conclude, our results revealed the role of language in social attention. This agrees with previous studies showing top-down influences in social attentional (Dalmaso et al., 2020). Our research contributes to this debate by testing one of the most critical human

abilities: language. Future research should address the robustness of this data pattern by further exploring the possible interplay between language, group affiliation, and social status. The results of the present study suggest that there are indeed context-specific influences on the gaze-cueing effect of faces belonging to different language groups, and that these influences are likely linked to hierarchical differences presented within the specific social context in which a language is spoken. Overall, exploring the possible role of linguistic identity in gaze-cueing of attention is crucial to foster our understanding of interpersonal communication and social attention mechanisms.

Chapter 4 | Language categorization and message interpretation

Lorenzoni, A., Pagliarini, E., Vespignani, F., & Navarrete, E. (2022). Pragmatic and knowledge range lenience towards foreigners. Acta Psychologica, 226, 103572.
DOI: https://doi.org/10.1016/j.actpsy.2022.103572

4.1. Introduction

A sentence like 'I have a large tattoo on my back' could be considered a credible statement if made by an adult, but ironic if made by a child. The identity of the interlocutor is an essential cue for successful communication. As shown by recent research, expectations regarding the age, gender, political or socioeconomic status of the speaker are drawn extremely rapidly during sentence comprehension and impact its interpretation (Bornkessel-Schlesewsky et al., 2013; Foucart et al., 2019; Jiang et al., 2013; Van Berkum et al., 2008).

In the same vein, the interpretation of an utterance is affected by accented speech. In an influential paper by Lev-Ari and Keysar (2010), trivia statements about world knowledge facts, mostly unknown to the participants, were uttered by speakers with a native or a foreign accent (e.g., 'A giraffe can go without water longer than a camel can'). Participants judged foreign-accented statements as less true than native-accented statements. Lev-Ari and Keysar interpreted their findings according to a 'fluency-intelligibility' account (see also Boduch-Grabka & Lev-Ari, 2021). As foreign-accented speech diverges from the standard accent, it would be harder to understand and it wouldbe perceived as less fluent; this in turn would negatively affect the credibility of a statement uttered with foreign-accented speech (Oppenheimer, 2008; Schwarz, 2004; Dragojevic et al., 2017). However, the role of processing fluency in message credibility (e.g., true/false judgments) has not been fully understood, as the results have not always been consistent. For example, Souza and Markman (2013) failed to find an effect of foreign accent on trust using the same paradigm as Lev-Ari and Keysar (see also Hanzlíková & Skarnitzl, 2017; Foucart & Hartusiker, 2021; for a partial effect of accent

on trust see, Podlipský et al., 2016). Furthermore, other studies using slightly similar paradigms have also failed to report significant effects between different types of accent speech on message credibility (Frances et al., 2018; Stocker, 2017).

Foreign-accented speech may not only affect the message's intelligibility, but it may also lead to an implicit categorization of the speaker as an outgroup individual (foreign) in terms of cultural and social heritage. Recent evidence shows that such categorization based on speech is an implicit and automatic process (Kinzler et al., 2010; Baus et al., 2017; Baus et al., 2021; Champoux-Larsson et al., 2021; Pietraszewski & Schwartz, 2014) and emerges in the first years of life (Begus et al., 2016; Howard et al., 2014; Liberman et al., 2017). Importantly, the classification of a person as an outgroup member entails the activation of the socio-cultural stereotypes associated with foreign groups and this in turn affects the trustworthiness of the message (Giles & Watson, 2013; Ryan, 1983; Stevenage et al., 2012; for evidence with children, see Kinzler & DeJesus, 2013). To avoid the possibility that trustworthiness was based on socio-cultural stereotypes, Lev-Ari and Keysar (2010) informed their participants that the speakers they heard were merely reciting statements provided by a native speaker and not the speakers' own statements. In this way, it was expected that the participants would ascribe the statements to native English persons rather than to the foreign speakers to whom they were exposed. However, since the auditory presentation of the material is interlaced with foreign or native speech signals, it is unclear whether such a procedure did avoid the automatic categorization of the speakers as native and foreign individuals. Thus, we cannot exclude that participants taking part in Lev-Ari and Keysar's study did activate associated stereotypes, influencing their judging of the statements.

While a large number of previous research has been focused on the impact of intelligibility accented-speech on trivia statement judgments (see for recent reviews, Formanowicz & Suitner, 2020), fewer studies have explored whether the identification of an

individual as a native or a foreign speaker has an impact per se on trivia statement judgments. Our main aim here was to address this last issue. To avoid any influence of physical signal associated with the speech, a written modality presentation of the statements is required. To the best of our knowledge, only two studies have adopted this strategy to date. In the following, we briefly review these studies before introducing the main aim of our empirical research.

In one of these studies, Foucart, Santamaria, and Hartusiker (2019) exposed to their participants in a familiarized phase to four speakers via short videos in which the speakers briefly described themselves. The speaker could have a native or a foreign accent and, in turn, they could be associated with a high or a low social status accent. In the main experimental task, electrophysiological measures were recorded while participants read three different types of sentences associated with one of the speakers. Sentences could contain true, false, or unknown statements, and participants were required to judge whether they were true or false on a 5-point scale. Ratings did not report significant differences between the different speech-accented speakers. However, ERP results suggested that statements associated with a low-status (accented) speaker were harder to process than statements associated with a high-status (accented) speaker.

In the second study, Fairchild and Papafragou (2018) used written materials to isolate the influence of speaker identity on sentence comprehension. In their study, participants first read a short-bio text description of two English speakers; one is described as a speaker with a native accent and one as a speaker with a foreign accent. Participants were then required to judge a series of written sentences attributed to the native or the foreign speaker. Besides true and false statements, the critical condition was composed of under-informative statements such as (1a).

(1) a. Some giraffes have long necks.

b. All giraffes have long necks.

c. Some giraffes, and possibly all, have long necks.

d. Some giraffes, but not all, have long necks.

Statements such as (1a) are literally true but sub-optimal in their manner of conveying information. From a logical point of view, (1a) is semantically compatible with (1b), as shown in (1c), but it is usually used to pragmatically intend a not all state of affairs, as in (1d).The enriched not all interpretation (1d) is a type of inference usually defined as a scalar implicature in linguistics (Fox, 2007; Gazdar, 1980; Sauerland, 2004); the listener assumes that the speaker could have used an alternative sentence containing all, which is more informative than a sentence with some.

In the study by Fairchild and Papafragou, participants tended to accept under-informative sentences more when they were attributed to foreign speakers rather than to native speakers. The authors concluded that participants tend 'to forgive' foreign speakers since the choice of an under-informative sentence could be attributed to a lack of competence on the part of foreign speakers (see also Fairchild et al., 2020).

In sum, the use of written materials allows to investigate whether linguistic identity has an impact on statement judgments by keeping equal the fluency processing. Unfortunately, the evidence collected so far is difficult to interpret because while Foucart et al. (2019) did not report behavioral differences on unknown statement judgments, Fairchild and Papafragou (2020) adopted an acceptability judgment task with under-informative statements. The main aim of the current research is to shed some light on whether speaker identity (native/foreign) modulates the judgment of unknown trivia statements, similar to the ones tested in the original study by Lev-Ari and Keysar (2010). We decide to use the paradigm developed by Fairchild & Papafragou (2018) since it showed significant effects in the judgment ratings. Before focusing

on the unknown statements, we decide to replicate the original finding of Fairchild and Papafragou (2018) with under-informative statements.

The present Study

In Study 5 (Under-informative Information Manipulation), our objective was to replicate the study of Fairchild and Papafragou on the derivation of the scalar implicature. To anticipate our results, Study 5 replicated the main finding of Fairchild and Papafragou. In Study 6 (Unknown Information Manipulation), we used the same paradigm to investigate whether the native/foreign dimension affects the goodness of unknown world knowledge facts. Based on negative stereotypes towards foreign individuals, we should observe lower ratings of acceptability of unknown written statements for the foreign speaker (Giles, 2013; Ryan, 1983; Stevenage et al., 2012). In contrast, according to the account of 'fluency-intelligibility' (Lev-Ari & Keysar, 2010), no differences are expected since written sentences will be used and therefore the intelligibility associated with each speaker condition is the same. To anticipate our results, we did report evidence for an influence of linguistic identity in the acceptability of unknown written statements about world knowledge facts. Study 7 aimed to replicate and generalize the new phenomenon observed in Study 6.

Study 5 and Study 6 included two different studies each. In studies 5a and 6a we used the same procedure developed by Fairchild and Papafragou (2018). In studies 5b and b, the same procedure was used with the difference that in addition to the biography, face photographs were associated with each of the two speakers. This was done with the scope of increasing the association between speaker and sentence. It has been shown that messages that appear with photos are more easily understood and remembered (Newman & Zhang, 2020), and, at the

same time, speaker faces enhance semantic processing of the message (Hernández-Gutiérrez et al., 2021).

Given that the sample size of their Experiment 1 of Fairchild and Papafragou (2018) was 114 participants, we decided to use a similar sample size and collected 126 participants per each single study (overall 252 for Study 5 and Study 6). The data collection of the two studies within Study 5 and Study 6 was designated and scheduled to begin at the same time. Due to an error in the distribution of participants in Study 5, more than the designated 126 participants were assigned to Study 5b and automatically, less than 126 to Study 5a. Participants who did not complete the whole experimental session, were not Italian native speakers, had a mean duration greater than three standard deviations of the group mean, or did not answer correctly the catch questions were discarded from the analysis.

4.2. Study 5: Under-informative Information Manipulation

Materials and methods

Participants. Data from two hundred and forty-four native Italian speakers were analyzed in Study 5 (mean age=25.49, SD=5.51), 99 (47 females) and 145 (60 females) for study 5a and 5b, respectively. Italian participants were recruited through the Prolific crowdsourcing platform (Palan & Schitter, 2018). The test was administered online and anonymously using Labvanced software (Holger et al., 2016). The experimental procedures were approved by the Research Ethics Committees of the University of Padova (Protocol number 3794).

Materials. The experimental set was composed of 20 under-informative sentences with the quantifier 'some', as in (1a). Furthermore, three filler conditions (20 sentences each) were added: true filler sentences containing 'some' ('Some hair is brown'); true filler sentences containing 'all' ('All snow is cold'); and false filler sentences containing 'all' ('All women are doctors'). By doing so, half of the sentences contained 'some' as a subject determiner and half of the sentences contained 'all' as a subject determiner (see Fairchild & Papafragou, 2018). All sentences were in Italian. The four types of sentences did not differ from each other in the number of words (all ts< 1).

Following Fairchild and Papafragou, four bio-descriptions were created, adapting them to Italian culture. Each short-bio gave either a description of Claudia, a native Italian speaker with a strong Roman accent (Native speaker condition), or of Svetlana, a native speaker of Moldovan with a strong Moldovan accent (Foreign speaker condition). There were two

versions of each speaker condition in which the speaker's hobbies and major varied (see Table 1). In addition, for study 5b, two color photographs of Caucasian women's faces were selected.

Table 1. Speaker short-bio descriptions

Native speaker	Foreigner speaker
Claudia is a student at the University of Padova, attends the faculty of **nursing / educational sciences** She is very good at her course of study, and she plans to become a **nurse / educator** after earning her degree. She moved with her family from Rome to Padova. Claudia has such a strong Roman accent that her classmates often make fun of her. In her free time, Claudia loves **walking / running.**	Svetlana is a student at the University of Padova, attends the faculty of **nursing / educational sciences**. She is very good at her course of study, and she plans to become a **nurse / educator** after earning her degree. She moved with her family from Moldova to Padova. Svetlana has such a strong Moldovan accent that her classmates often make fun of her. In her free time, Svetlana loves **walking / running**.

Procedure. Study a consisted of two blocks: a native speaker block and a foreign speaker block (counterbalanced between participants). Sentences within each bock were evenly distributed across the four sentence types (10 of each) and were presented in a random order. At the start of each block, one of the four speaker bio-descriptions was presented, and participants were instructed to read it carefully (familiarization phase). Then, three multiple-choice comprehension questions were presented to evaluate whether participants had read the bio-descriptions carefully. The participants were then instructed to read 40 sentences that were originally uttered by the speaker they had just read (judgment phase). Sentences were presented in random order. For each trial, a sentence appeared in the center of the screen together with the ratings scale below. The speaker bio-description was presented at the top of the screen. The participants had a maximum of 7 seconds to rate how much sense each sentence made on a five-point scale (1-"Completely no-sense" and 5-"Completely sensible"). To ensure that participants paid attention throughout the course of the study, we added six catch trials in which participants were asked to press a specific number on the keyboard.

For study 5b the same procedure was used with the following differences: during the familiarization phase, the two bio-descriptions were presented at the beginning of the

experimental session together with one face photograph. Two face photographs of Caucasian young women were selected and association between face and language condition was counterbalanced across participants; during the judgment phase, sentences were presented together with the face at the top of the screen instead of the bio-description. The 80 sentences were presented in random order with a short break after 40 sentences. See Figure 1 for details of the procedure.

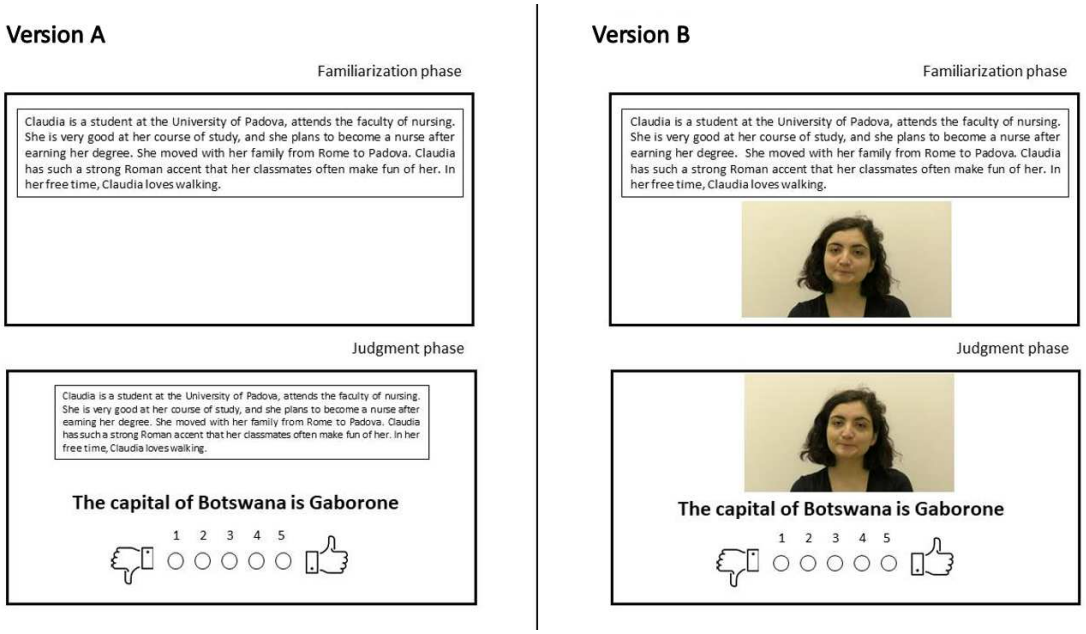


Figure 1. Procedure of Study 5 (5a and 5b) and Study 6 (6a and 6b).

Analysis. Analyses were performed on the responses to the critical sentence condition ratings using R software (R Core Team, 2018). Ordinal logistic regression was employed in the form of a cumulative link mixed model (Christensen, 2015), as implemented by the function clmm of the Ordinal package (Christensen, 2018). In the mixed models, the factor Speaker (native vs foreigner) and Study (5a vs 5b) were introduced as fixed effect. Participant and Item were included in the model as random effects. Two models were constructed, with and without the interaction of the two fixed effects. The fits of the two models were compared using the

Akaike information criterion (AIC; Akaike, 1987). The AIC compares the models at once and gives information on a model's relative evidence, so that the model with the lowest AIC has the best fit (Wagenmakers, & Farrell, 2004). For complete analysis with filler sentences see Appendix A.

Results and discussion. Performance in the three comprehension questions presented at the end of the familiarization phase was very high, ensuring that participants had read the speaker descriptions carefully (99% and 98%, in Study 5a and Study 5b, respectively). The comparison between the two models revealed that the best model was the one without the interaction. The results of clmm revealed a main effect of the Speaker, SE=0.05, z = -2.01, p=.04. In particular, ratings for under-Informative sentences were higher in the Foreign speaker condition (M=2.55, SD=0.95) than in the Native speaker condition (M=2.49, SD=0.93). The main effect of Study was not significant, SE=0.21, z = 1.45, p=.14. See Table 2 for results divided by study. The results show more acceptable judgments for under-informative statements when associated with foreign speakers than with native speakers. This pattern nicely replicates the main findings of Fairchild and Papafragou (2018) in Italian language and using Italian and Moldavian speakers' identity.

4.3. Study 6: Unknown Information Manipulation I

Materials and methods

Participants. Data from two hundred and thirty-nine native Italian speakers were analyzed in Study 6 (mean age=25.32, SD=5.12), 114 (62 females) and 125 (52 females) for Studies 6a and 6b, respectively. The same recruitment method as for Study 5 was used.

Materials, procedure and analysis. The experimental set was composed of 20 unknown sentences ('The capital of Botswana is Gaborone'). Unknown sentences were trivia statements about world-knowledge facts mostly unknown to the participants. In addition, two filler conditions, 20 sentences each, were added: true known sentences ('To play tennis, you need to have a racket') and false known sentences ('Arachnophobia is the fear of having fun'). The three sentence types did not differ from each other in the number of words (all ts < 1). The same task and presentation modality as for Study 5 was used. The same analysis was performed as in Study 5. For complete analysis with filler sentences see Appendix A.

Results and discussion. Performance in the three comprehension questions presented at the end of the familiarization phase was very high, ensuring that participants had read the speaker descriptions carefully (98% and 99%, in Study 6a and 6b, respectively). The comparison between the two models revealed that the best model was the one without the interaction. The results of clmm revealed a main effect of the Speaker, SE=0.06, z= -2.13, p=.03, as ratings for unknown sentences were higher in the Foreign Speaker (M=2.99, SD=0.46) condition than in the Native Speaker (M=2.95, SD=0.42) condition. The main effect of Study was not significant, SE=0.14, z= -1.14, p=.25). See Table 2 for the results divided by study. Results show more acceptable judgments for unknown statements when associated with

foreign speakers than with native speakers. To our knowledge this is the first evidence of such a positive bias versus foreign speaker in message interpretation. Before further discussing this finding, we aimed to replicate it in Study 7.

Table 2. Average of the ratings in Study 5 and Study 6 split by manipulation and type of study. Standard deviations are reported into parentheses.

Speaker	Study 5 (Under-informative)		Study 6 (Unknown)	
	Study 5a	Study 5b	Study 6a	Study 6b
Native	2.34 (0.87)	2.58 (0.96)	2.98 (0.40)	2.92 (0.43)
Foreign	2.45 (0.83)	2.62 (1.02)	3.02 (0.45)	2.96 (0.47)

4.4. Study 7: Unknown Information Manipulation II

The main objective of Study 7 was to replicate and test the generalizability of the results reported in Study 6. To this end, we introduced some modifications to the design of Study 6 and provided a conceptual replication rather than a direct replication (Agnoli et al., 2021). First, we changed the language assigned to the foreign speaker. This is because Moldovan is a romance language like the native language of the participants, that is, Italian. This fact could cause participants in Study 6 to still perceive the Moldavian accent as similar to their own accent. In Study 7 we aimed to increase the distance between the language of the foreigner and the native speaker, by using a language with a more diverse phonetic repertoire with respect to Italian. To this end, the language attributed to the foreigner was Lithuanian, a language belonging to the Baltic group. Second, we quadrupled the number of experiment items and tested 80 statements in the critical unknown condition. Third, although significant, the magnitude of the Speaker effects in Studies 5 and 6 was relatively small. This was probably due to the fact that a five-point scale was used. In Study 7 and following recent studies (Boduch-Grabka & Lev-Ari, 2021; Foucart & Hartsuiker, 2021), we used instead a 100-point slider and worked with a continuous rather than an ordinal dependent variable, following recent studies. Four, Study 5 and 6 showed that same patterns when statements were presented together with either bio-descriptions (studies 5a and 6a) or faces (studies 5b and 6b), suggesting that the modality of the implementation of the link between speaker and statement was not a key factor. On the basis of this, we decided to present the statements together with the speaker's face only. To help participants to associate the face with the corresponding assigned nationality, a national flag was presented together with their faces (see Grainger, Declerck & Marzouki, 2017). Five, in Study 6 participants were required to judge how much the sentences made sense. This question differs from the standard question used in other studies evaluating unknown statements (LevAri & Keysar, 2010; Souza & Markman, 2013; Hanzlíková & Skarnitzl, 2017;

Podlipský, Šimácková, & Petráž, 2016; Foucart et al., 2019; 2020; Foucart & Hartsuiker, 2021). Thus, in Study 7 we changed the main judgment task and asked participants to give their judgments on truthfulness instead of goodness. Finally, in Study 6 participants were not directly asked how trustworthy they find the speakers; therefore, it remains an open issue whether participants find foreign speakers more trustworthy than native speakers. To directly address this issue, in Study 7 we asked the participants to judge the two speakers in terms of reliability and pleasantness at the end of the statement judgment phase, to be able to make a conclusion on the participants' assessment of the speaker's moral character. To do that, we used one of the five solidarity traits (pleasant) reported by Dragojevic & Giles (2016). Furthermore, the affective response of the participants was assessed by having them indicate their feelings towards the speaker using a 100-point feeling thermometer scale (Dragojevic, 2020).

Materials and methods

Participants. Data from one hundred and fifteen native Italian speakers were analyzed in Study 7 (mean age=25.28, SD=5.03, 57 females). The same recruitment method as for Study 5 and 6 was used.

Materials. The experimental set was composed of 80 unknown sentences ('The capital of Botswana is Gaborone'). As for Study 6, two filler conditions, 40 sentences each, were added: true known sentences ('To play tennis, you need to have a racket') and false known sentences ('Water is a chemical compound of hydrogen and fluorine'). The three types of sentences did not differ from each other in the number of words (all ts < 1). The same bio-descriptions as for studies 6b and 6b were used, with the following differences: i) Svetlana (Foreign speaker condition) was replaced with Adelë, a native speaker of Lithuania with a

strong Lithuanian accent; ii) in the short-bio description related drawings congruent with the description were added in order to help the memory of the participants (e.g., the drawing of a girl running to illustrate that one of the speaker's favorites hobbies is to run) ; iii) during the judgment of the sentences, the flag indicating the speaker's country was presented together with the speaker's face.

Procedure. Half of the sentences within each sentence type were presented in the native-speaker condition and the other half in the foreign-speaker condition counterbalancing across participants. Pairing of faces with speaker conditions was also counterbalanced among participants. Speaker bio-descriptions were presented one at time and participants were instructed to read them carefully. Three multiple-choice comprehension questions were presented at the end of the familiarization phase to evaluate whether participants had read the bio-descriptions carefully. The participants were then instructed to read 160 sentences that were originally uttered by the speaker they had just read about. Sentences were presented in random order. For each trial, a sentence appeared at the top of the screen with the slider below. The face of the speaker and the flag indicating the nation were presented in the center of the screen. The participants had a maximum of 7 seconds to rate the amount of truth each sentence made on a 100-point slider (1-"Completely false" and 100-"Completely truth"). In addition, at the end of the statement judgment phase, participants had to answer three questions about the two speakers: the first question asked participants to judge on a 100-point Likert scale what their overall feelings towards the speaker were (1-very negative; 100-very positive); the second and third questions asked participants how much they found each speaker reliable and pleasant on a 7-point Likert scale (1-not at all; 7-much).

Analysis. Linear mixed-effects regressions were performed on the ratings to the critical Unknown items using the lme4 package (Bates et al., 2008). In the mixed model, the factor Speaker (native vs foreigner) was introduced as fixed effect, and Participant and Item as random effects. We compared this model with a null model with only Item and Participant as random effects. For complete analysis with filler sentences see Appendix B.

Results. Ratings for unknown sentences were higher in the foreign speaker condition (M= 50.19; SD=8.78) than in the native speaker condition (M=48.68; SD=9.02). The results showed that the model including Speaker variable was better than the null model, $\chi 2(1) = 9.52$, p=.002. The model estimated an effect of Speaker of 1.52, SE=0.49, t=3.08, p=.002, in the direction of higher ratings for unknown sentences when attributed to the foreign speaker, showing that comprehenders judged sentences differently depending on whether they believed that a native or a foreign speaker had said the sentences.

Furthermore, paired t-test analyzes were performed to assess final judgments on positive / negative feelings towards the speakers and on how reliable and pleasant the speakers are. The results showed that foreign speakers were judged better in all three dimensions. In particular, compared to the native speaker, the foreign speaker was considered more positive (foreign M=77.05; SD=16.60; native M=73.87; SD=18.96; $t(114) = 2.11$, $p = 0.037$); more trustworthy (foreign M=5.56; SD=0.97;native M =5.38; SD=1.09; $t(114) = 2.28$, $p = 0.024$); and more pleasant (foreign M=5.57; SD=1.08; native M=5.31; SD=1.04; $t(114) = 2.46$, $p = 0.015$).

Discussion. In Study 7, Unknown sentences were judged to be truer when attributed to the foreign speaker than when attributed to the native speaker. This result replicates the pattern observed in Study 6. Critically, Study 7 generalizes the phenomenon to a new set of

materials, with different nationality contrast (Italian/Lithuania), and using a continuous dependent variable instead of an ordinal dependent variable. Furthermore, the foreign speaker was judged as more trustworthy, more pleasant, and overall generated more positive feelings compared to the native speaker.

The fact that foreigners were considered more trustworthy, more pleasant and generated more positive ratings in Study 7, seems to suggest that foreigners generate a positive bias in our participants, contrary to previous literature (Dewaele & McCloskey, 2015; Fraser & Kelly, 2012; Fuertes et al., 2012; Giles, 2013; Gluszek & Dovidio, 2010). If this were the case, we should expect a positive correlation between the differences of the judgments on the statement in the two speaker conditions and the differences between the judgments over the speaker. That is, having a more positive opinion for a specific individual (i.e., the foreign speaker) could engage higher scores during the judgment task. To explore this possibility, we ran three correlation analyses on a participant basis. For each participant, the difference between the mean responses in the statement rating task between the two conditions (native/foreign) was calculated. We then correlated this difference with the difference between the two scores each participant gave to native and foreign speakers in terms of trustworthy, pleasant and positive/negative feelings. However, neither of these correlations was significant ($ps > 0.47$).

4.5. General discussion

The influences of two factors may be responsible for sentences uttered to a foreign speaker being judged worse. One possible factor is that foreign-accented speech is harder to understand and therefore may imply a reduction of cognitive resources devoted to message processing. A second possible factor is the automatic categorization of the speaker as a foreign individual that activates negative stereotypes. Indeed, foreign-accented speakers are usually judged as less trustworthy, less educated, less intelligent, and less competent than native-accented speakers (Dewaele & McCloskey, 2015; Fraser & Kelly, 2012; Fuertes et al., 2012; Giles, 2013; Gluszek & Dovidio, 2010). It is difficult to disentangle the influence of each of these two components when auditory materials are used. In this research, we used written materials. Our results showed that the categorization of speakers as foreign or native speakers per se modulates the acceptability and the truth of sentence statements regardless of differences of processing linked to fluency.

In Study 5, acceptability ratings for under-informative sentences increased when comprehenders believed the sentences were uttered by a foreign rather than a native speaker, replicating in Italian previous findings reported in English (Fairchild & Papafragou, 2018). In Studies 6 and 7, the acceptability and trustworthiness ratings for unknown sentences increased when participants believed that these sentences were stated by a foreign rather than a native speaker. This effect seems incongruent with the 'fluency-intelligibility' account (Lev-Ari & Keysar, 2010) and with the prediction of lower judgments for foreign speakers tied to negative stereotypes associated with individuals from the outgroup. Finally, in Study 7, the foreign speaker was considered more trustworthy, more pleasant and generated more positive feelings than the native speakers.

Where does the advantage for foreign speakers come from? Regarding the under-informative condition, and in agreement with Fairchild and Papafragou (2018), we interpret the 'pragmatic lenience' toward foreign speakers in accordance with comprehenders's belief about the linguistic competence of foreign speakers. Since foreign speakers are expected to be less accurate in their lexical choices compared to native speakers, the choice of a pragmatic under-informative statement would be forgiven more often in foreign speakers than in native speakers (see also Fairchild et al., 2020 and Grey et al., 2018; Grey & Van Hell, 2017; Hanulíková et al., 2012 for a similar phenomenon with syntactic violations).

Regarding the advantage for foreigners in unknown statements, a possible explanation may rely on the different attribution of general knowledge to foreign and native speakers when an unknown sentence is presented. Participants might attribute a range of knowledge to foreign speakers that may be different from their own knowledge (Labov, 2006). Critically, the knowledge attributed to the native speaker can be expected to be very similar to the participant's own knowledge because the native speaker is an individual of the same social and cultural heritage. When an unknown statement is presented, participants would not have enough information to judge the acceptability or truth of the statement and would base the judgment on the knowledge attributed to the speaker. The higher ratings on the foreign condition suggest that participants tended to trust foreign speaker knowledge more than native (same) knowledge in case of uncertainty (unknown statements). Something we will call 'knowledge lenience' towards foreign speakers.

Indirect evidence for this 'knowledge lenience' toward foreigners may come from electrophysiological studies. For example, several studies have explored semantic processing under foreign and native speech conditions using the N400 which is a standard electrophysiological index of semantic congruency (Goslin et al., 2012; Romero-Rivas et al., 2015; Song & Iverson, 2018). These studies reported different N400 modulations between

foreign-accented sentences and native-accented sentences, suggesting different semantic processing between the two speaker conditions. Based on our findings, we conclude that different semantic processing may be due (in part) to the different knowledge attribution participants ascribed to foreign and native speakers. Thus, we predict that a similar electrophysiological modulation would be obtained if, instead of auditory sentences, written sentences associated with a foreign or a native speaker were used. Partially congruent with our prediction is the study of Foucart and colleagues (2019). These authors reported different modulations on the N400 component between sentences associated with speakers of different social status (high and low), suggesting that speaker identity modulates the semantic processing. Critically, as described in the Introduction, Foucart and colleagues used a written presentation of the sentences. It is relevant to note that foreign and native speech also differ on early ERP deflections, as the N100 and P200 components (Jiang et al., 2020; Romero-Rivas et al., 2016; for discussion see Foucart et al., 2020; Foucart & Hartsuiker, 2021).

Our findings also have relevant implications to account for the apparently inconsistent pattern of results that have been obtained regarding the role of accented-speech on trivia unknown statement judgments. As described above, some studies reported a negative bias in trust judgments for foreign-accented speech compared to native-accented speech (Lev-Ari & Keysar, 2010), while other studies did not report such an effect. It has been proposed that the contrasting pattern may be explained by adaptation. Speech perception is a highly flexible process that can adapt quickly to accented speech (Bradlow & Bent, 2008; Romero-Rivas et al, 2015). Some studies report that such a flexible adaptation may cancel out the impact of reduced processing fluency on sentence judgments (Lev-Ari & Keysar, 2010; Boduch-Grabka & Lev-Ari, 2021; Souza & Markman, 2013). Based on this, one factor determining the negative credibility for statements uttered with foreign-accented speech would rely on fluency processing. The findings we report here, which show an effect of lenience towards foreigners,

suggest that there may be another factor affecting sentence judgments. This would be the linguistic and socio-cultural identity of the speaker. Once we know a particular individual is a foreign-speaker, we would tend to forgive her lack of linguistic competence because we expect this individual to be less competent linguistically than a native-speaker. At the same time, we attribute a range of knowledge to foreign speakers that differ from our own knowledge; this would lead to trusting foreign speakers under uncertainty conditions, that is, when for instance we are required to judge the credibility of unknown trivia statements. More research is needed to understand the possible interaction between these two factors (i.e., fluency and speaker identity) in message interpretation.

In sum, our results suggest that native speakers do not only tend to forgive less linguistic competence of foreign speakers, accepting as more sensible under-informative statements, but also, they tend to trust foreign speakers more in situations of lack of knowledge. These findings have relevant social implications since they suggest that the identity of our interlocutor affects the interpretation of the message. In other words, message interpretation cannot be dissociated from who is communicating the message.

4.6. Appendix

Appendix A- Analysis including filler conditions (Studies 5 and 6)

False statements that were judged with 4 or 5 ratings and true statements that were judged with 1 or 2 were consider outlier responses and removed from the analysis (6% and 3% for Study 5 and Study 6, respectively). For Study 5, the factor Speaker (native vs foreigner) and Sentence Type (Under-Informative, True-Some, True-All, False-All) were introduced as fixed effects. For Study 6, the factor Speaker (native vs foreigner) and Sentence Type (Unknown, True, False) were introduced as fixed effects. Participant and Item were included in the models

in both studies as random effects. The same analysis as in the main analysis was performed. In Study 5, the comparison between the two models revealed that the best model was the one without the interaction. The results of *clmm* revealed a main effect of the Sentence Type, $p<.001$. The main effect of Speaker was not significant, $p=.31$ (see Table A1). In Study 6, the comparison between the two models revealed that the best model was the one with the interaction, $p = 0.006$. The results of *clmm* revealed a main effect of the Sentence Type, $p<.001$. The main effect of Speaker was not significant, $p=.21$ (see Table A2).

Table A1. Average of the rating in Study 5. Standard deviations are reported in parentheses.

Speaker	Sentence Type			
	Under-informative	True (Some)	True (All)	False (All)
Native	2.46 (0.93)	4.56 (0.46)	4.50 (0.38)	1.40 (0.38)
Foreign	2.53 (0.95)	4.59 (0.46)	4.51 (0.35)	1.41 (0.38)

Table A2. Average of the rating in Study 6. Standard deviations are reported in parentheses.

Speaker	Sentence Type		
	Unknown	True	False
Native	2.95 (0.42)	4.79 (0.28)	1.16 (0.26)
Foreign	2.99 (0.46)	4.76 (0.30)	1.18 (0.29)

Appendix B- Analysis including filler conditions (Study 7)

False statements that were judged above 75/100 ratings and true statements that were judged lower 25/100 were consider outlier responses and removed from the analysis (a total of 3.1% ratings). We compared three models. In all three models, Participant and Item were included as random effects. In the first model, the factors Speaker (native vs foreigner) and

Sentence Type (Unknown, True, False) were included as fixed effects. In the second model we included the interaction between these two factors. In the null model there was not fixed effects. The results showed that the model including the interaction was better than the other two models, p=.001. The main effect of Sentence Type was significant, $p < .001$. The main effect of Speaker was significant, p=.02 (see Table B).

Table B. Average of the rating in Study 7. Standard deviations are reported in parentheses.

Speaker	Sentence Type		
	Unknown	True	False
Native	48.68 (9.02)	94.94 (5.12)	4.94 (5.44)
Foreign	50.19 (8.78)	94.08 (6.18)	5.39 (6.38)

Chapter 5 | Conclusions and future developments

Language is social. Communication has evolved as a cooperative effort and often implicitly shapes our communicative interactions (Ferreira, 2006; see also Clark, 1996). We easily adjust our expectations to who we are talking to, reflecting the fact that what is informative or relevant to one individual might be trivial or irrelevant to another. In the same vein, addressers use the knowledge about other people to make sense of what they say (Nieuwland et al., 2010). That is, the content of what is said (the message) is inextricably interlaced with who is saying it (the speaker). For example, a sentence like "I have a large tattoo on my back" could be considered a credible statement if made by an adult but ironic if made by a child. In other words, the identity of the interlocutor, in this case the distinction between child and adult, is an essential cue for successful communication. In particular, the age of our interlocutors is a critical cue to categorize them and to infer which message they will probably utter. The same process occurs with other relevant information of our interlocutors, such as gender and race (Meissner & Brigham, 2001; Rhodes & Anastasi, 2012; Sporer, 2001). For instance, hearing a child say a sentence like "I just quit smoking" or a man say "I am pregnant" induces an ERP component that indicates surprise, suggesting that listeners are making inferences about the speaker during sentence comprehension. In other words, addressers use the knowledge about other people to make sense of what they say (Nieuwland et al., 2010).

In this thesis, I have focused on a less explored cue, the language of our interlocutor. In this respect, research is scant of studies on the role of language. That is, while decades of research has been dedicated to the study of particular categories such as race, age, and gender, language has been a relatively ignored cue in social categorization. Therefore, firstly, this dissertation aimed to tackle the role of language as a cue for social categorization; secondly,

this dissertation aims to investigate whether the linguistic identity of the speaker determinates social attention; and thirdly, the evaluation of message.

The general and most relevant conclusion that we can bring out from the present empirical work is yes! Language is a critical cue for social categorization that shapes our attentional resources and affect message interpretation. Below I detailed the main conclusions of each of these three main topics separately. We first examined the potential implicit effect of language on social categorization (Chapter 2). We then extended these findings by investigating the role of language in shaping social attention (Chapter 3). Finally, we sought to explore whether the linguistic identity of the speaker affects message interpretation (Chapter 4). Through this dissertation, we have established that language is automatically and implicitly used as a cue for social categorization. We provide evidence that language is a robust cue for social categorization, able to modulate social attention. Finally, we provide evidence for the role of linguistic identity in shaping the interpretation of the same message.

The role of language in social categorization

The first aim of this thesis was to explore whether language categorization is an automatic phenomenon. Therefore, we investigated if categorization based on language takes place even when the languages associated to the faces cannot be ascribed to different social communities. To do this, in two studies, we tested bilingual communities. Unlike what normally occurs in monolingual communities, in bilingual communities the two languages belong to the same socio-linguistic context, and this means that people do not distinguish between different social groups from language. In doing so, we used the memory confusion paradigm, a standard way to implicitly measure social categorization. Our results suggest that language is used as a social category for faces even in communities where the language is not

critical for categorizing people. Interestingly, this happens when both languages are officially recognized, as Basque and Spanish in Study 1; and when bilinguals use an official language and a non-official regional language, as Italian and Venetian in Study 2. This is the first evidence showing the categorization effects of language in bilingual communities. Past studies investigating language as a cue for social categorization have used two languages (or accents) that belonged to two different sociolinguistic contexts. The study of bilingual communities is critical in determining whether categorization based on language is an automatic phenomenon. These results are crucial for the literature that supports the need to include language in the "big three" of social categorization.

The two groups of population we tested differ in terms of social identification. As mentioned in Chapter 2, the Basque population has more identification with the Basque culture and society than with the Spanish one. On the contrary, in the Venetian population that we tested, the participants identified themselves in the same way with both the Venetian and Italian culture. In other words, while in the Italian-Venetian population there was no preference for one culture or the other, in the Spanish-Basque population there was a preference for the Basque culture. The results did not show an influence of identification on the categorization based on language, because the inclusion of this variable in the mixed models did not lead to a modulation of the categorization effect. However, we cannot exclude the possibility that social-cultural variables may modulate the categorization of language. Future research can investigate this aspect directly.

About 60 million people mainly speak the Italian language in Italy. As often happens in languages spoken by millions of people, the Italian language is characterized by the presence of many Italian regional accents. Each Italian regional accent corresponds to each of the pronunciation varieties of the Italian language, specific to a geographical area and easily identifiable in the various regions of the Italian peninsula. A possible future study would be to

study different accents of Italian by comparing participants from different regions. Given this feature of the Italian language, our Italian context made up of numerous different regional accents can offer us the ideal space to test this possibility. Studies in the literature have suggest that some accents, which are considered standard or prototypical for a given country, are usually associated with high-status. On the other hand, some accents are considered as "sounding strange(r)" and their speakers are associated with lower social position (Foucart et al., 2019). The concept of associating standard speech with high status and nonstandard speech with low status is particularly relevant, as the social standing of the speaker can be conveyed and detected through his or her voice (Cheng et al., 2016; Formanowicz & Suitner, 2020; Ko et al., 2015). In this project, we focused on the influence of the participant's identification towards the two languages/cultures. A question for future research could be about social status. In particular, whether the social status associated with a language can influence this categorization effect. The results of chapter 3 are connected with this idea.

Language categorization and social attention

The second aim of the present dissertation was to investigate the role of language in guiding social attention. In particular, we explored whether the gaze-cueing effect was modulated by the linguistic identity associated with facial stimuli. To this end, we employed a standard gaze-cueing paradigm and manipulated the linguistic identity of the cueing faces through a preliminary familiarization phase. Results indicated that participants were more likely to confuse faces from the same language category than from the other language category, supporting previous findings on the role of language as a cue for social categorization. Moreover, results from the gaze-cueing paradigm suggest that attention was likely modulated by the linguistic identity, suggesting that linguistic identity is a critical cue during social

attention. To our knowledge, this is the first evidence that demonstrates implicit linguistic categorization affects social attention. That is, these results revealed for the first time the role of language in social attention. Our findings are in agreement with theories that predict top-down influence in social attention (Dalmaso et al., 2020). Thus, our research contributes to this debate by adding one of the most critical human abilities: language.

A critical finding of our results is that the three languages used have been shown to have different social statuses for Italian native participants. Importantly, our results replicated previous findings suggesting less interference on gaze cueing for lower status face-stimuli. Accordingly, we reported that those faces associated with a lower social status language yielded no effects. In sum, besides the effect of *ingroup*/*outgroup* social categorization, our findings seem to suggest the critical role of status on gaze cueing modulation. Future research should address the robustness of this pattern of our data by further exploring the possible interplay between language, group affiliation, and social status. The results of the present study suggest that there are indeed context-specific influences on the gaze-cueing effect of faces belonging to different language groups, and that these influences are likely linked to hierarchical differences present within the specific social context in which a language is spoken. Overall, exploring the possible role of linguistic identity in gaze-cueing of attention is crucial in fostering our understanding of interpersonal communication and social attention mechanisms.

An interesting way to further address the interaction between language and social attention is to focus on a different attentional mechanism, the attentional holding. Attentional holding can be interpreted as complementary to the gaze-cueing effect, as it would help individuals to monitor the potential approaching behaviours within social environments. Moreover, direct-gaze is an engaging and important social cue, and it plays a crucial role in interpersonal perception, as it allows people to detect the approaching behaviours from others.

Additionally, eye contact provides the foundation for communication and social interaction (Csibra & Gergely, 2006; Kleinke, 1986), modulating the development and activation of the social brain network (Senju & Johnson, 2009).

Language categorization and message interpretation

Speakers with a foreign accent are usually judged as less trustworthy, less educated, less intelligent, and less competent than native speakers (Dewaele and McCloskey, 2015; Dragojevic and Giles, 2016; Fraser and Kelly, 2012; Fuertes et al., 2012; Giles and Watson, 2013; Gluszek and Dovidio, 2010; Lev-Ari and Keysar, 2010; Livingston et al., 2017). From a social origin of this bias, it has been argued that since an accent reveals the speaker's identity, a foreign-accented speaker is rapidly categorized as an out-group member and is considered more negatively than a native speaker (in-group member; Bartlett, 1932; Bestelmeyer et al., 2014). In Chapter 4, we investigated whether the bias generated by a short exposure to a foreign accent influences the perception of a speaker. In order to remove any influence of audio processing we used written material. To address whether language categorization (between foreign/native speakers) influences message interpretation participants first familiarized with a native and a foreign speaker. After this familiarization phase, participants had to judge written sentences. The critical sentence type for our purpose were unknown trivia statements. Because the information was unknown, participants had to rely on the speaker's knowledge to evaluate the acceptability/veracity of the sentence. Hence, if some speakers are perceived to be less reliable than others, the information they provide should not be as easily accepted as that from a reliable speaker. Our results showed that the acceptability and trustworthiness ratings for unknown sentences increased when participants believed that these sentences were stated by a foreign rather than a native speaker.

This chapter provided relevant contribution to account for the apparently inconsistent pattern of results that had been obtained regarding the role of accented speech on trivial unknown statement judgments. As described in Chapter 4, some studies reported a negative bias in trust judgments for foreign-accented speech compared to native-accented speech (Lev-Ari & Keysar, 2010), while other studies did not report such an effect. Together, our findings have relevant social implications since they suggest that the identity of our interlocutor affects the interpretation of the message. In other words, message interpretation cannot be dissociated from who is communicating the message.

Furthermore, and in relation to the possible influence of status associated to language in the categorization effect we discussed above, it could be of interest to explore the impact of regional accents in the interpretation of message. As we described above, Italian language presents many regional accent variations that could be used to classify individuals into specific groups. It can be of interest to explore whether the leniency effect we observed in Chapter 4 towards foreign speakers is present in speakers that speak a different regional accent of Italian (see also Foucart et al., 2019).

5.1. Relevance of this Dissertation

In this globalized world, interactions with individuals in a language other than our mother tongue is increasingly common. While we are likely to experience someone speaking to us in our foreign languages, it is just as likely that we become the 'foreigners' when we travel, live abroad or find ourselves in multicultural settings. Therefore, this is an issue that affects each and every one of us with a face and a language. For this reason, a continued and renewed research focusing on how we think about language as a social category matters not only for the psychological sciences but also for society (Kinzler, 2020).

Psychologists and linguists have argued that our current society normalizes linguistic discrimination (e.g., Ng, 2007). In other words, we see linguistic discrimination as so pervasive that we do not give it the same careful examination we give to biases based on other variables (such as race). Nevertheless, people who speak with a non-native accent, or people who speak in dialects that are considered by some to be less standard (even though all dialects are equally legitimate forms of speech), such as African American English, can face severe forms of prejudices (Baugh 1995; Gluszek & Dovidio 2010a,b; Mufwene et al. 1998). Gluszek & Dovidio (2010) argue that during communicative processes, accents influence the speaker, the listener, and the interaction between them through related social and contextual factors.

Importantly, language cross with race and other social categories, and people are not always aware of the ways in which our linguistic biases play out in the real world. An emerging field of raciolinguistics explores the interconnectedness of linguistic and racial categories (Rickford, 2016). In particular, raciolinguistics examines how language is used to construct race and how ideas of race influence language and language use. Although sociolinguists and linguistic anthropologists have previously studied the intersections of language, race, and culture, raciolinguistics is a relatively new focus for scholars trying to theorize race throughout language studies. For instance, to sound more appealing to Western customers, employees in Indian call centres try to "whiten" their voices (Ramjattan 2019). Alike, studies of housing and employment discrimination in the United States show that race-based discrimination is sometimes complex and incorporates aspects of speech. Future research on person perception, stereotyping and prejudice, and intergroup cognition should study more specifically language as a social category as well as explore how language interfaces with other categories. In addition, exploring whether the linguistic identity of a face modulates social attention and message evaluation is important because it could have relevant implications for understanding social interactions.

In sum, the aim of this thesis was to take the first steps in the study of the role of language as a cue for social categorization. While psycholinguistics, the study of the interrelation between linguistic factors and psychological aspects, only considered the linguistic aspects of production and comprehension, in this thesis we focused on the role of who is speaking in relation to who is listening. That is, the aim of this thesis is to highlight the importance of considering both the speaker's and the listener's perspectives at the same time, because interaction and communication necessitate taking into account both parties simultaneously (Krauss & Fussell, 1996).

Going beyond this project, the study of the role of language as a cue for social categorization could lead to even newer and still unexplored avenues for understanding communication. For example, it would be interesting to investigate the influence of the linguistic identity of the interlocutor on attentional mechanisms in face-to-face interactions. I am convinced that the understanding of the processes that modulate our communicative interactions can be used to improve our social awareness and help us to overcome prejudices and stereotypes, thereby making a better society to everyone, both speakers and listeners.

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List of publications

Papers and conference presentations stemmed from the work presented in the thesis.

Papers:

Lorenzoni, A., Calignano, G., Dalmaso, M., & Navarrete, E [under rewiev]. Linguistic identity as modulator of gaze-cueing of attention. Scientific Reports.

Lorenzoni, A., Santesteban, M., Peressotti, F., Baus, C., & Navarrete, E. (2022). Language as a cue for social categorization in bilingual communities. Plos one, 17(11), e0276334.

https://doi.org/10.1371/journal.pone.0276334

Lorenzoni, A., Pagliarini, E., Vespignani, F., & Navarrete, E. (2022). Pragmatic and knowledge range lenience towards foreigners. Acta Psychologica, 226, 103572.

https://doi.org/10.1016/j.actpsy.2022.103572

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https://doi.org/10.1371/journal.pone.0254513

Conferences:

Lorenzoni, A., Navarrete, E. Cognitive implications of language as a cue for social categorization. 7th Barcelona summer school on Bilingualism and Multilingualism (Barcelona-Spain, 13-15 September 2022).

Lorenzoni, A., Santesteban, M., Peressotti, F., Baus, C., & Navarrete, E. The power of language as a social cue. Associazione Italiana di Psicologia-Sezioni unite (Padova, 27-30 September 2022).

Lorenzoni, A., Faccio, R., Exploring the role of foreign accent speech on credibility. Associazione Italiana di Psicologia-Sezioni unite (Padova, 27-30 September 2022).

Lorenzoni, A., Vespignani, F., Pagliarini, E., Greatti, E. & Navarrete, E. Does this sentence make sense? It depends on who said it! European Social Cognition Network (ESCON) 2021 (Salzburg, 13-16 September 2021).

Lorenzoni, A., Santesteban, M., Peressotti, F., Baus, C., & Navarrete, E. Esplorando il ruolo del linguaggio come spunto per la categorizzazione sociale. Associazione Italiana di Psicologia-Sezione Sperimentale (Lecce, 8-10 September 2021).

Lorenzoni, A., & Navarrete, E. Language as a cue for social categorization in bilingual communities [poster presentation]. 17th International Conference for Young Researchers in Psychology (Lille-France, 2nd December 2022).

Lorenzoni, A., Calignano, G., Dalmaso, M., & Navarrete, E. The role of linguistic identity as a modulator of social attention [poster presentation]. 22nd meeting of the European Society for Cognitive Psychology ESCoP (Lille-France, 29 August-1 September 2022).

Lorenzoni, A., Pagliarini,, E., Vespignani,, F., & Navarrete, E. Pragmatic and knowledge lenience toward foreigners [poster presentation]. Experiment in Linguistic Meaning conference (University of Pennsylvania, 18-20 May 2022).

Acknowledgements

I apologize to people who do not speak Italian but, given the caring component of the role of language, this section requires to be expressed in my native language. In questi tre anni, ho avuto la fortuna di essere circondata da persone che mi hanno supportata e si sono prese cura di me e del mio lavoro. Non ci sono parole per esprimere la gratitudine che ho per tutte queste persone, senza le quali tutto questo non sarebbe successo, ma ci proverò. Vorrei ringraziare il mio supervisor, il prof. Eduardo Navarrete, e la mia co-supervisor, la prof.ssa Francesca Peressotti, per avermi guidata in questo percorso, con professionalità e stima, ma anche con tanti momenti di condivisione che sono andati oltre il lavoro. Vorrei ringraziare specialmente Eduardo. Sono sicura che senza la sua più totale fiducia non sarei mai potuta arrivare dove sono arrivata ora. Grazie per aver assecondato ogni mia richiesta, per essere stata una guida senza imposizioni, per avermi spronata a dare sempre il massimo: "AVANTI TUTTA!".

Un grazie speciale a Francesco Vespignani, Mario Dalmaso, Caterina Suitner e Anne Maas, per avermi dato i migliori consigli e per la stima reciproca che ci ha unit* in questi anni; a tutte le studentesse che hanno lavorato con me in questi anni e in particolare a Elena, Otilia, e Rita; a Giulia Calignano per avermi impartito le migliori pillole di statistica, dalle quali è nato uno speciale rapporto di amicizia; a Zhimin, per aver calmato le mie agitazioni con la sua pragmatica; alle mie amiche "sociali" Alessia, Alice e Carmen, per aver compreso le mie

sciocche domande da social-naïve e per aver condiviso con me questi tre anni. Grazie a Libera e Simone: senza di voi non sarebbero stati gli stessi questi anni. Grazie per le pause assieme, per aver condiviso con me tutte le frustrazioni, le paure, le ansie, ma anche le soddisfazioni e le gioie.

[*code switching*] Thank you also to the people in Barcelona. First, to my supervisor Cristina Baus. Cris, without your laughter I could hear from my office these last PhD months would not have been the same. Thank you also for our terrible results, which allowed us to spend many hours together thinking about them. Thanks to Pam, Andrès, and Jaume, who from the very beginning understood and spent their time helping me; Anastasia, Sara, and Zan: thank you for making me experience incredible moments and for making me experience Barcelona. See you soon!

Grazie alla mia famiglia, Andrea, Loris e Valeria, a cui dedico questa tesi. Grazie per avermi sempre dato la possibilità di scegliere i miei obbiettivi da sola, nonostante che cosa ricercassi con questo pallino della ricerca non fosse molto chiaro. Grazie ad Andrea, per essere il miglior compagno di vita possibile e per avermi sempre ricordato che il duro lavoro alla fine ripaga sempre; alla mia seconda famiglia Cristina, Elena e Maurizio; ad Anna, Giulia ed Anna, per essere con me da tutta la vita. Ultimo ma non meno importante, vorrei ringraziare me stessa: per non aver mai mollato, per tutto questo lavoro, per aver avuto momenti bui da cui mi sono rialzata più forte di prima.