

# The effect of foreign language on emotion regulation

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## **Abstract**

The use of a foreign language can influence various aspects of our lives. From the decisions we make to the therapies we undertake. A recent study shows that fear acquisition is weaker in a foreign language context, suggesting a modulatory role of foreign language in conditioning processes. Here we aim to extend knowledge about this so-called foreign language effect and explore its influence in other psychological paradigms. First, we examine how the effect affects the fear extinction mechanism (Chapter I), then the emotion regulation strategy of cognitive reappraisal (Chapter II), and finally the processing of negative experiences (Chapter III). The results point to extinction in a foreign language context being as useful as doing so in a native language context, despite the additional arousal involved in using a non-native language. Similarly, the reappraisal technique is effective in both languages, also showing an improvement in self-reports when confronted with the threatening stimulus. Finally, the language used seems to modulate the relationship between traumatic symptoms and emotionality when retrieving negative memories, being a milder modulation in the foreign language. These results are the first indications of the influence of foreign language in the field of psychotherapy and add to what is known about the effect of foreign language.



## Resumen

El uso de una lengua extranjera puede influir en varios aspectos de nuestra vida. Desde las decisiones que tomamos hasta las terapias que emprendemos. Un estudio reciente demuestra que la adquisición del miedo es más débil en un contexto de lengua extranjera, lo que sugiere un papel modulador de esta en los procesos de condicionamiento. Aquí pretendemos ampliar el conocimiento sobre este llamado efecto de la lengua extranjera, y explorar su influencia en otros paradigmas psicológicos. En primer lugar, examinamos cómo afecta el efecto al mecanismo de extinción del miedo (capítulo I), después a la estrategia de regulación de la emoción de la reevaluación cognitiva (capítulo II) y, finalmente, al procesamiento de las experiencias negativas (capítulo III). Los resultados apuntan a que la extinción en un contexto de lengua extranjera es tan útil como hacerlo en un contexto de lengua nativa, a pesar de la excitación adicional que supone utilizar una lengua no nativa. Del mismo modo, la técnica de reevaluación es eficaz en ambos idiomas, mostrando además una mejoría en las valoraciones de los autoinformes al enfrentarse al estímulo amenazante. Por último, la lengua utilizada parece modular la relación entre síntomas traumáticos y la emocionalidad al recuperar recuerdos negativos, siendo una modulación más suave en la lengua extranjera. Estos resultados son los primeros indicios de la influencia de lengua extranjera en el campo de la psicoterapia y se suman a lo que se conoce sobre el efecto de la lengua extranjera.



## **Preface**

We live in increasingly multilingual environments, whether in our daily lives, in movies and TV series, or when traveling. Little by little, this multilingualism is creeping into our lives. More and more people move to other countries and must make use of the resources they find there in a language they do not master as well as their native language. Among the many situations or circumstances that promote multilingualism, whether in your home country or not, there are more specific environments where it is less common to find yourself in a bilingual or multilingual environment, such as in the therapeutic environment. As it is a resource to which one consciously decides to go, it is already within the clinical setting that one can negotiate and choose one language or another. Depending, of course, on the languages spoken by both therapist and patient. *A priori*, everything indicates that the therapist's native language, even if not the patient's own native language, is the natural language in which to conduct the therapy. However, as long as the individual's foreign language is at a relatively good level, it can be considered as another option in psychological treatment, or that is what is beginning to be contemplated nowadays.

That is precisely the starting point of this dissertation. Here we contemplate the increasingly frequent circumstance of people in a situation of attending psychotherapeutic treatment with more than one language available. Far from being seen as a barrier, the use of a non-native or foreign language can be seen as an opportunity, or even as a tool. This novel idea comes from the psychological tradition, in

which clinical cases were already reported with patients who preferred to use a language other than their mother tongue to deal with anxiety issues or painful experiences they had lived (Freud, 1893; Marcos, 1979). Later, this "detached" effect of a foreign language took shape in the field of decision making, where a recurring pattern was found in which choices in moral judgments and dilemmas were more rational, with fewer risks, and was eventually baptized as the "foreign language effect" (Costa et al., 2014; Keysar et al., 2012). This language effect apparently "detaches" you emotionally from certain aspects.

This intriguing phenomenon was later transferred to other areas in order to be explored, and one of the most recent ones is psychotherapy. In a novel study in which using an aversive conditioning paradigm, participants were presented with a fear acquisition task, some in their native language, others in a foreign language, they observed that fear acquisition was weaker for the group that had completed the task in the foreign language (García-Palacios et al., 2018). This change in emotionality could be determinant in other psychotherapeutic paradigms. That study is the predecessor to this project and the one that laid the groundwork for starting a new batch of studies. Thus, Chapter I addresses another phase of conditioning, fear extinction, as a sequel to that predecessor study. Although we do not find the same attenuating effect in the foreign language, we do find effective extinction. In Chapter II we address the foreign language effect as a possible influence on the emotional regulation strategy of cognitive reappraisal when facing phobic stimuli. Here interesting disparities begin to appear depending on the measures, in which either no differences are seen between languages, or a glimpse

of them. Chapter III, finally, explores this effect from the point of view of negative memories, and it turns out to appear as a modulator of emotionality when traumatic symptoms are greater.

As new literature surrounding this phenomenon emerges, its boundaries and how it works are delineated, depending on many factors such as level of proficiency, cultural distance with that foreign language, age of acquisition, and many others. Here we have tried to observe this softening effect of a foreign language in some concrete paradigms of psychotherapy but knowing that it is only a grain of sand on a long beach. We will now take a closer look at that grain of sand.





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# 1. GENERAL INTRODUCTION

Societies around the world are thriving on cultural and linguistic diversity. In these circumstances, the need to use a foreign language instead of a native language is becoming more and more frequent. Nowadays, a great percentage of the population speaks more than one language in different levels of proficiency: Current estimates pull a 43% of the world population being bilingual and 17% being multilingual ([ilanguages.org](http://ilanguages.org)). It is very common these days to find this population since in this globalized world many people move to other countries to live for a period of time or even settle there. With almost half of the humans walking the earth speaking more than one language, it feels very normal the need to use a foreign language to develop their life, whether going to the doctor, going shopping or sometimes going to the psychologist. That includes talking in everyday life about feelings and emotions and thoughts not only in their native language but also in their second or third language.

The importance of language in interacting with our emotions has been supreme since almost unknown times. Language has evolved over the centuries and even millennia to adapt more and more closely to human needs. It is not surprising, then, that today we come to consider using different forms of language in order to graduate our level of emotionality. The need to use a language other than one's native one has reached healthcare services, including mental health services, where patient-therapist encounters with different available languages have increased. Mental health services expose some disparities in treatments regarding minorities among other (Griner &

Smith, 2006), advocating for interventions that are adapted to the cultural background of patients. Concerning language, within the clinical setting there is a predominance of monolingual psychotherapy (Pavlenko, 2005). The World Health Organization (2017) has been called upon to include the imbalance or inequalities in the multilingualism in the therapeutic environment as one of the inequalities to address and to improve for mental health services (Costa, 2021). We receive words and phrases as a representation of thoughts and emotions. Likewise, language itself is capable of arousing emotions in listeners and readers. Beyond what its content means to us, words can depend on factors such as the context in which they are learned or expressed, and the linguistic context can be an important component in the modulation of emotions, especially the use of a non-native language.

It is important here to conceptualize what we mean by a foreign language, and its characteristics. A foreign language would then be a language acquired in an academic context, rather at a later stage in life, and with a lower level of proficiency in comparison to the native language. Although this thesis will not go into the details of specifying why one group of bilinguals or another or examining the characteristics of the foreign language used, it is relevant to note that bilinguals or multilinguals with these characteristics have been shown in previous studies to have a foreign language effect.

The type of bilingual experience has been shown to be relevant in the clinical setting. The importance of discussing or negotiating the language to be used by the patient during the treatment process has been argued (Foster, 1998; Rolland et al., 2021), assuming it to be a determining factor in the development or outcome of the therapy. For

example, switching languages (Dewaele & Costa, 2013) or language matching have been valued by some clinical cases as intervention options to carry out certain tasks or parts of the psychotherapeutic treatment that provide therapeutic value. Thus, having more than just the mother tongue, usually linked to various emotional experiences, can broaden the range of possibilities and add therapeutic value to treatments that have more than one language available. But it is particularly in encounters where the patient must adapt their language to their foreign language in order to deal with the therapist that the question arises as to whether the procedure will be equally effective. So, the question that pops up from these variety of circumstances is whether being in a different language context from the native one, influences the efficacy of the treatment.

Here we will explore a quite novelty issue respecting the use of different languages in some paradigms within psychotherapy. The question we are after to respond is: Does the use of a foreign language have an effect in modulating emotional processes during psychotherapeutic paradigms?

## **1.1 Background of the foreign language effect**

Over the past few years there has been a tendency for bilinguals to consider strong remarks (e. g., reprimands, taboo words, swear words) as more emotional when perceived in the native language (Dewaele, 2004; Harris, 2004; Harris et al., 2003). Theoretically, classical contexts did not consider that language could have an influence beyond meaning, however, some research fields started to show interest in the implications of bilingualism in non-directly related processes such as intuition or reasoning. Even though research in different areas has

consistently exposed a substantial response in a native language compared to a different language, the area of decision making provided consistent evidence of the foreign language effect.

### **a) Foreign language effect in decision making**

The area of decision making aimed to explore this different impact between one language and the other in a framework where choices could be influenced by this imbalance. Keysar et al., (2012) explored decision making in the native and in a non-native language from the framework delineated by Kahneman and Tversky, (1979), that is, that our decisions can change depending on how they are presented to us. What Keysar discovered is that this change or difference in decision making depending on how they are presented disappears if the problems were presented or stated in a foreign language. Specifically, they observed that loss aversion ceased to be so influential in us in a non-native language, that is, the loss framework would not cause such a negative emotional effect in this second language, and consequently, it would not lead to risky responses. This contributed to the belief that our judgments and preferences were not as guided by a calculation of probabilities and rational thought as we sometimes naively believe. The authors attributed this phenomenon to a reduction in emotionality associated with a foreign language, which was called the Foreign Language Effect (FLE). Subsequently, Costa et al., (2014) supported these results and nurtured the extension of the effect by exploring another aspect of decision making: moral dilemmas. Bilinguals made more utilitarian decisions in their foreign language, choosing more frequently the most rational option, in this

case, sacrificing one person to save five. Later studies corroborated the presence of this effect in other dilemmas and fallacies, such as a decrease in the perception of a bigger chance of positive outcomes (“hot-hand” effect) in a foreign language (Gao et al., 2015), or a reduction in the illusion that two events are causally connected (causality bias) (Díaz-Lago & Matute, 2018).

Other studies outside the field of decision making are in line with these findings. Geipel et al. (2016) found that the use of a foreign language influenced the evaluation of intentions when presenting positive and negative intentions and outcomes, decreasing the weight of the moral evaluation. Although Costa et al., (2019) found in a similar paradigm that the foreign language had no relevant impact on intentions and outcomes. This effect also contributes to the blurring or suppression of superstitious related to good or bad luck under certain circumstances such as broken mirrors (Hadjichristidis et al., 2019). More recently, attitudes towards vaccination were found to be influenced depending on whether information was provided in the native language or in a foreign language, finding that information in a foreign language strengthened trust in the effectiveness of the vaccine and resulting in a decline of hesitancy (Geipel et al., 2022). From what we have seen here, it would seem that using a foreign language is always a good option. However, this effect has not always been found in experiments.

Some experimental studies did not find differences at an emotional level between both languages. Studies such as Eilola and Havelka, (2011) argue that attentional processes are affected by a threat to the same extent in both native and foreign languages. As do other studies before them (Eilola et al., 2007; Sutton et al., 2007). It



seems to generalize to a number of languages as parent languages. Other laboratories, for example, have found that emotional effects on memory were not altered differently in one language or another (Ferré et al., 2010). Or comparing translation equivalents in two languages (native vs foreign), event related potential (ERP) waves resulted in a similar waveform pattern in both languages. Also switching languages affected equally in both languages in a decision making task (Oganian, et al., 2016).

We see that these inconsistencies occur regardless of the tasks or languages used. However, this is a less remarkable number than the studies that do show differences between languages. Still, with these somewhat diverse and contrasting results, one would expect different kinds of results. Differences between languages may or may not be found. The truth is that there are many features mediating this effect, and these should be explored little by little.

## **b) Understanding the effect**

At first glance, it seems logical to place this phenomenon at two apparently opposite poles of a dichotomy. It would be Kahneman and his dual-process theory of judgement who would provide a framework for understanding these two different routes of thought that would lead to different outcomes. Roughly speaking, on the one hand we would have a more intuitive route, and on the other, a more reasoned one. The former would be a faster and more automatic way of thinking, in which not too much cognitive effort would be required to reach the outcome of a task. As an example, individuals would generally reject to use sugar from a bottle labelled cyanide, because knowing that it is sugar, they would not be able to avoid recognizing

the irrational aversion (Rozin & Nemeroff, 2002). In the same way, it would be a route of thinking that would also not consume too many cognitive resources, in contrast to its counterpart. The second way of thinking would be a more deliberate and slower way of reasoning, which would require tax cognitive resources. As Kahneman (2002) stated, it would be the system in charge of our self-control. It is the type of thinking that would help us to solve problems or find solutions by following our knowledge of, for example, calculus. Regarding choices, it seems that premises related to deontological issues would be more consistent with the support of the intuitive route, while more utilitarian judgments would be supported by the rational route (e. g. Cushman, 2013). Although the effect of a foreign language seems to mitigate more the fast and intuitive route than it strengthens the slow and rational one, there are doubts as to the mechanism to be followed.

Despite the growing literature nurturing this effect from several areas of research, the disparity of the effect of a foreign language has shown some controversy in various aspects, among them, its origin and the characteristics that make it present.

### **c) Mechanisms underlying the foreign language effect**

Many studies have already shown support for the presence of this effect. However, some authors put in question the mechanism by which it exists.

A foreign language is often seen as a slower language, due to lexical revision translated into a language we do not master (Ivanova & Costa, 2008). Linguistically, it is more difficult for us to find the right words in a foreign language and to use them frequently, including

affective words (Opitz & Degner, 2012). This fact supports the idea that the foreign language effect may be based on this inequality. More importantly, this imbalance in foreign language use has in part been associated with a higher cognitive cost.

Increased deliberation and psychological distance could emerge from the recruitment of added cognitive processing resulting from additional cognitive effort in a non-native language (Caldwell-Harris, 2014). Native language inhibition depletes resources, resulting in increased cognitive control (Gao et al., 2015; Jończyk et al., 2016). This increased demand on cognitive resources would translate into less fluent processing (Caldwell-Harris, & Aycıçeği-Dinn, 2021), and again, this disparity in processing between languages would lead to an advantage of the native language in some specific domains. This fact is reflected in a similar way in the brain structures in charge of cognitive control, showing a higher engagement in a foreign language compared to a native one (Abutalebi et al., 2013; Branzi et al., 2016).

This different cognitive processing extends to the parts of the brain related to emotionality. The amygdala itself, the region par excellence representing emotion in the brain, reduces its activation when a great cognitive load intervenes (Pessoa et al., 2002), as well as showing a reduction while reading positive texts in a foreign language (Hsu et al., 2015). Yet, it shows controversial results when foreign language comes into the picture (Vives et al., 2021). These points to the fact that an increase in reflection and thinking would lead to fewer biases in decision making dilemmas, as we saw above.

Generally, lower language fluency is related to greater cognitive effort, and so we might use this as a clue to understand one of the possible mechanisms behind the foreign language effect.

Several studies support the strength of greater cognitive processing as the cause of the differential effect, far from ascribing emotional distance as a mediator of the differential effect. Oganian et al., (2016) pointed out the nuance that their results were not due to an emotional reduction but to an enrichment of the cognitive control. In their study, they found a reduction in the framing effect when this was followed by switching languages, both into the native and the foreign one, so they associated this decrease with an enhancement of cognitive control.

Nevertheless, a different perspective claims that such psychological distance is grounded in a decrease of emotionality instead of an enhanced cognitive load. Studies addressing emotional intensity from a behavioral perspective have found that such intensity was greater in the native language. Bond and Lai (1986) found that between embarrassing and non-embarrassing topics, native speakers were the ones who talked less about embarrassing topics. Emotional reactivity has been considered a key factor in the understanding of the foreign language effect, a factor that varies according to the language used. A foreign language can prompt less intense emotional reactions through words or sentences (Ivaz et al., 2016). Within the area of decision making and judgements, Hadjichristidis et al., (2015), for example, corroborated this effect with higher benefit and lower risk judgements in a foreign language through what they outlined as a more positive affect, that is, a different emotional processing rather than a more rational or deliberate process. In a related line, in a study investigating both personal moral conflict and psychological distance in bilinguals, they found that in these dilemmas implicitly involving intuition and personal conflict, more utilitarian responses were found

in the foreign language (Shin & Kim, 2017). Reducing the emotional response by decreasing the self-bias effect when presenting the labels in the non-native language produced the foreign language effect. Thus, the authors assumed as the driving force behind this effect that the difference between languages was the consequence of a lower emotional response. In short, there would be much support, as Hayakawa et al., (2017) stated, that 'People are more utilitarian when using a foreign language not because they think more, but because they feel less.'

However, there is no consensus yet on the mechanisms behind this effect.

As some authors point out, it may not be strictly necessary to determine a single mechanism driving this particular effect, as it may be present either through cognitive resources, through dumping emotion or even both (Geipel et al., 2016). They are, after all, different ways of processing our information, which in this case have the same way of manifesting themselves. Which of these mechanisms influences the foreign language is yet to be established.

### **- Type of bilinguals**

There are several factors that make the foreign language effect such a particular phenomenon and which may explain the perception of psychological distance. To begin with, the main factor identified as creating a difference between a native and a non-native language lies in the source of its learning, namely the context of language acquisition. The native language is usually acquired in a familiar and emotionally rich context, whereas a foreign language is more often acquired in an academic and emotionally poorer environment. As the native language

was learned through social interactions in this warmer environment rather than through academic instruction, it implies stronger emotional ties. This stronger native language base gives rise to other relevant factors that influence the particular characteristics of the foreign language effect. Age of acquisition is a factor associated with proficiency, as learning a language at an earlier age usually leads to greater proficiency and thus greater competence (Eilola & Havelka, 2011).

There are other open discussions about the extensibility of a foreign language becoming more emotional over time, for example, as Dewaele (2010) argued, with wider use and longer immersion. In turn, these causes are closely related to frequency of use (Degner et al., 2011), as another determinant factor as this can develop in the social interactions mentioned above, amplifying the number of words in our baggage, including emotional ones (see Caldwell-Harris, 2015 for a discussion). Interestingly, the fact that a greater amount of cognitive load is needed in a non-native language indicates that it is people with low proficiency who benefit most from this difference. So, the difference between languages is tentatively born out of these different characteristics. In addition, it seems that, indeed, what is really important are the characteristics of the language used regardless of whether it is native or even foreign, as was shown in a study in which the participants expressed their preference for Spanish, both those who had it as a native language and those who had it as a foreign language, pointing out the importance of the characteristics of the second/foreign language in relation to cultural influence and other relevant factors (Guttfreund, 1990). For this reason, the bilingual or multilingual participants who are usually chosen in such experiments

meet these characteristics from which the foreign language effect can then emerge.

What is remarkable about these characteristics is that they result in a meaningful difference between languages and are reflected in a substantial way in the effect they can have in different fields. Ultimately, these particular properties reveal an effect that has been defined by some authors as an emotional or psychological distance. Commonly associated with a reduction in emotional response and greater processing control (Corey et al., 2017), this term is understood as an abstract representation in which we are able to separate symbolically from our self in relation to other aspects (Trope & Liberman, 2010). Basically, it refers to a subjective distance with the material or situation presented to us. Ultimately, it seems that emotional differences would be enhanced according to the above-mentioned characteristics, i.e., when the native language has been learned in a familiar context and the non-native language in a more academic context and somewhat later in life, and is, in turn, a less mastered language (Caldwell-Harris, 2015).

## **1.2 Foreign language effect and emotions**

The way in which emotions direct us is influenced by a variety of contexts, factors, situations, etc. One of these elements is language, specifically the use of a foreign language. Although using a foreign language seems to have some impact on emotionality, it is not clear in what way. No direct connection between emotionality and foreign language effect has been found so far, yet it seems that they are somehow related.

To begin with, it is not entirely clear what we mean by emotional processing. Pavlenko (2012) established as a basis for his conclusions on affective processing the appraisal theory (Scherer, 2009). According to this theory, affective processing would be the automatic appraisal of verbal stimuli that would produce somato-visceral responses, which we could measure in the form of arousal with physiological measures, and that this automatic appraisal could be registered as a subjective feeling at the level of higher cognition.

Evidence has established some indirect connections between language and emotions. Hadjichristidis, Geipel and Savadori (2015) found that judgment when assessing hazard situations in a foreign language evoked more positive affect and consequently lower judgments of risk and higher benefits. This notion of judgement through emotional processing was supported in a study in which the foreign language effect could increase the willingness to consume aversive products through the attenuation of the perception of the emotion of disgust (Geipel et al., 2018). Actually, when experiments have tried to look for the presence of the foreign language effect in people's preferences in different situations, this effect was only present when the situation involved emotional factors (Vives et al., 2018). In this line, Brouwer (2021) delineated the presence of the effect when the moral dilemmas that were presented to the participants had an influence at a personal, rather than impersonal, level. These indications have been recently supported by a study by Dylman & Champoux-Larsson (2020) in which they explored different languages and different factors that characterized them and found that the cultural factor was a determinant in the presence or absence of the foreign language effect, since having learned a foreign language in a cultural



context more similar to your native one makes this language acquire emotional touches as well.

In a certain way, this emotional impact is understood under the concept of psychological distance. As addressed previously, this concept is related to the idea of a detachment effect (Marcos, 1976), which states that the use of a foreign language functions as a psychological barrier when what is being experienced becomes too emotional. What seems undeniable at this point is that this effect appears in some situations where emotions are involved in some way. Even though the connection between foreign language and emotions has been found at different levels, it was already intuited from the offices and the cases seen in the clinical setting.

### **1.3 Foreign language effect in psychotherapy**

Native language generally feels like the organic choice when initiating psychotherapy. In fact, this is supported by data showing fewer dropouts (Sue, 1998). Yet, even though patients seem to prefer the use of their native language, there have been indications throughout the psychological tradition from the patient's perspective that point to a certain preference in certain circumstances for the use of a foreign language rather than the native one, particularly when approaching an emotional issue. Some authors claim the shift of some of their patients to a non-native language in which they were not so proficient to address some of their most painful memories. Freud (1893) already reported that some of his bilingual patients turned to their foreign language to address aspects of their anxiety as a way of detachment or disconnection from that topic. Similarly, other authors have described

the function of a non-native language as a barrier for their patients to become emotionally involved in the process (Movahedi, 1997). Some cases show a patient who appeals to the native language to connect more deeply with his emotional part and to be able to access feelings of distant memories (Aragno & Schlachet, 1996). As a matter of fact, it has been recognized that speaking several languages might generate the impression of disengagement between the self and traumatic emotions, feeling protected under the emotional distance provided by a non-native language (Costa & Dewaele, 2014). The self-perception can actually be greatly different when developing a past experience in these two different languages. As stated by Koven (2001), the choices made to explain the story vary in the type of communication or the discursive style. From the experiential setting, both therapists and patients have shown their opinions in this regard. Multilingual therapists stated that language switching served as a means to help release and share specific parts of the patient's history, as well as to enhance the bond and trust between therapist and patient. Some authors comment, for example, that the use of idiomatic expressions in a foreign language was part of the disclosure during a self-understanding phase (Santiago-Rivera et al., 2009). Patients themselves seem to take the initiative to switch languages more than the therapists themselves, especially when emotional issues are touched upon, so it seems that they value the very possibility of benefiting from having both languages available, the native language to promote bonding with the therapist, and the foreign language to address emotional issues from a more distant perspective (Dewaele & Costa, 2013).

Having more than just the native language available, usually linked to various emotional experiences, can broaden the range of

possibilities, and add therapeutic value to treatments, so that it can be used selectively if necessary. More than one language accessible to use in the therapeutic process can sometimes provide flexibility to the treatment, and a further option as a tool in terms of trust and even usefulness.

### **a) Foreign language effect in the laboratory**

Empirical studies have shed some light on this different outlook between languages on emotional material from different perspectives. Decision making, advertising, and other fields closer to psychology have also explored this difference.

Using a non-native language helps expressing widely some parts of the personality that feel more contained in the native language, while in the foreign, they feel free to express or unlock other parts of themselves (Ozańska-Ponikwia, 2013; Wilson, 2013). In a similar note, the differential vision from memory tasks shows that emotional response is stronger when the emotional words are spoken or heard in the native language compared to the foreign one, leading to a more solid memory of said words in the former (Ayçiçeği-Dinn & Caldwell-Harris, 2009). Despite these findings in a variety of fields related to emotional aspects, there is a lack of studies addressing more specific psychotherapeutic paradigms. The following part introduces some of the first studies exploring particular strategies within the field of psychotherapy.

### **b) Implications for fear conditioning and extinction**

Within all the fields covered in psychotherapy, exposure therapy is one of the basic techniques for treating many disorders, especially fear-based clinical disorders, such as anxiety. Anxiety disorders are one of the most frequent disorders, with a 20% prevalence in adults (Kessler et al., 2005). Since anxiety disorders are usually treated from cognitive-behavioral therapy and use exposure therapy as a basis, we could conceive of psychotherapy as influencing cognitive factors that in turn affect emotional problems (Beck et al., 2005).

Exposure therapy provides a foundation for conditioning and extinction, two paradigms tightly connected with the emotion of fear. On the one hand, the conditioning of fear establishes a fear learning after a series of exposures to a threatening stimulus. On the other hand, the extinction of fear is considered the equivalent method to exposure therapy in an experimental setting, whose objective is the progressive decrease to a threatening stimulus after repeated presentations to that stimulus. Both processes are intertwined with language as an important part of the procedure to achieve a modification in the participant. Following the idea of the foreign language effect, a different language might as well have an effect on these paradigms. This idea was firstly tested by García-Palacios et al. (2018) in a study focused on the effect of a foreign language in the acquisition of fear. In this study participants went through a phase of conditioning either in a native or in a foreign language, obtaining a weaker fear response in the foreign language in comparison to the group doing the conditioning in the native language. This study served in part as a precursor to this project, in which we addressed the natural following part with a similar paradigm, the extinction of fear.

These two processes are involved in a framework of learning of fear, since the original fear association achieved during conditioning is not erased during extinction, but instead lays down a new specific extinction memory (Bouton, 2002). As the emotion of fear is a common factor in this project, it is important to highlight that, as in many other emotional processes, the amygdala is narrowly linked to fear, even when no cognitive processes are consciously active (Öhman et al., 2007).

Other relevant methods or strategies in which the emotion of fear, among others, plays an important role will be discussed below.

### **c) Implications for emotion regulation strategies**

Within the main strategies in the field of psychotherapy, emotion regulation strategies represent a line of growing interest both in research and in clinical practice. They have been described as the set of strategies that individuals use to manipulate their emotional experience and expression (Gross, 1998). They are commonly used to treat phobias or emotional disorders, among others. They are even often combined with exposure therapy to cope with a particular fear. Among the existent adaptive strategies used to accomplish emotional changes, dual-process models define a division between those that are processed implicitly and unconsciously (affect labeling) or those processed explicitly and consciously (reappraisal) (Gyurak et al., 2011). The implicit strategies, despite being more automatic, involve certain level of intention. Yet the explicit processes denote a higher deliberation and premeditated effort.

Generally, emotion regulation strategies are based on language, linked intrinsically by inner speech (Zelazo & Cunningham, 2007). In

this way, patients must make use of language to transform and regulate their thoughts and, in consequence, their emotions. As mentioned, a foreign language is characterized by additional control processes, which contribute to the subjective experience of psychological distance with the emotional situation. Crucially, distancing oneself from the situation is a successful technique to regulate emotions (Kross & Ayduk, 2011). Given the characteristics of the emotion regulation strategies and the inherent controlled processing involved, a more effective outcome in combination with a foreign language could be suggested. The additional cognitive load and hence the slower processing of a foreign language is relevant then for such therapies involving language, promising a more effective regulation.

Some studies have already established the impact that language can have on our emotions. For example, using words or labels during exposure to aversive images reinforces the depletion of the emotional response even more than exposure alone (Tabibnia et al., 2008). More recently, Morawetz et al., (2017) found that content labeling in a foreign language was more effective in reducing the emotional response than the native language, revealing an advantage of the foreign one in this specific regulation strategy. As the research in emotion regulation strategies and a foreign language is still limited, any attempt to broaden the literature on this topic adds scientific value. And the field of emotion regulation strategies is quite extensive to be explored.

One of the main strategies of cognitive modification related to emotion regulation which has acquired especial attention is reappraisal. The strategy of reappraisal refers to the conscious transformation or reinterpretation of the situation in order to alter its emotional impact

(Gross, 1998). Some studies provide evidence that explicit regulation strategies such as reappraisal could approach a feared object or situation more efficiently, since the patient is aware of what he is doing. Research consistently shows that people using the strategy of reappraisal instead of other non-adaptive emotion regulation strategies or even other adaptive ones, seem to report feeling significantly less negative emotions (Ochsner & Gross, 2008). Phobias are a particular anxiety disorder grounded in the emotion of fear, in which reappraisal has shown good achievements, constituting one of the main tools in the clinical setting when having to approach a fearful object (Hermann et al. 2013). Reappraisal can overlap with rumination as both entail cognitive engagement with an emotional situation or stimulus. Yet, reappraisal implies the explicit pursue to reinterpret and elaborate a particular situation or idea with the determination of modifying its meaning and consequently its emotional experience. Interestingly, this additional cognitive demand suggests a potential link to language. Unfortunately, the literature on this strategy in a foreign language is very scarce. But Morawetz et al., (2017) showed in their study that reappraisal was proved to be a useful emotion regulation strategy when confronting aversive pictures in both languages, even above other strategies such as content labeling and emotion labeling. Yet they found no difference or advantage of one language or the other in the self-reports. These results had to still be tested under the vision of physiological measures. The lack of research on cognitive reappraisal invites to broaden the limits of this specific strategy in conjunction with the influence of a foreign language.

#### **d) Implications for negative memories retrieval**

Language is undoubtedly a major component of another greatly studied field: memory. In the search for approaches that could benefit from the use of a foreign language and were suitable, painful autobiographical memories usually involve a burden of stress and anxiety that does not escape the influence of language. Language has been stated as one of the important traces in the process of encoding memories, as labels are usually unavoidable in the perception process and consequently, memorization (Loftus & Palmer, 1974). Thus, the use of one language or another appears to be an important and influential factor. Although not extensively tested empirically, the area of autobiographical memories has also shown indications of an influence of non-native language use.

So far, even if anecdotal, some examples cited through the past years have shed light on the use of a foreign language in therapy while dealing with memories. We find the case that traumatic memories stored and experienced in the native language during childhood are later accessed by bilinguals in the same language (Aragno & Schlacher, 1996), with details of the memory ultimately being more easily retrieved in the language in which it was encoded (Javier et al., 1993). A study by Schwanberg (2010) unveiled the stronger emotionality of nineteen bilinguals when retrieving painful memories from childhood in their native language in comparison to their foreign language, emphasizing in some cases more clarity and vividness in the former. While there are different patterns in the literature as well as the reported by Schrauf (2000), in which switching from one language to another, or the use of words in one language or another, evokes memories with greater or lesser intensity, it is true that



there is no single consensus. In fact, one of the patterns mentioned by this author is the case of switching from the foreign language to the mother tongue at some point during therapy in order to facilitate access to patients' unavailable memories. As in the example given by Greenson (1950), a bilingual German woman who was conducting therapy in English, her foreign language, reported having a dream in her mother tongue. However, when asked to recall the dream in her mother tongue, she refused on the grounds that "I have the feeling that by speaking in German I will have to remember something I wanted to forget" (p. 19). Thus, there is a strong relationship between strong emotionality in recalling memories in the native language and a perceived emotional distance to those memories in a foreign language.

All this suggests a priori that if the memories were stored in the native language, accessing them in this language would involve greater emotionality, and in contrast, retrieving them in a non-native language would involve a lower level of emotionality. But this is only the intuition from these previous studies. Recently, however, some studies have shed some light experimentally on this difference between languages in aspects closer to psychotherapy, specifically in the processing of emotions and negative events.

Dylman and Bjarta (2018) focused on the psychological distress caused by processing negative emotions and the potential effect that the use of a foreign language in contrast to the native language can have in diminishing that distress. They had a group of bilinguals read texts with negative or neutral content and then answer questions related to that text in a deeper processing mode. Both the texts and the questions were alternatively in the native or foreign language, and from both either cross-languages or in the same

language. The most effective combination was found to be the one where the text was read in the native language but processed in the foreign language, resulting in less self-reported distress. On the other hand, and focusing more on negative autobiographical memories, Jansson and Dylman (2021) followed this trail in which a stronger response or more lime emotional response is associated in a foreign language when confronting negative material. They had a group of bilinguals recall a negative event of their past in their native language, while afterwards half of the participants were asked to reactivate this event in the native language again, and the other half in their foreign language. Whereas the reported levels of emotionality decreased equally and were not influenced by one language or the other, the perception of vividness did suffer a greater decrease when the event was reactivated in the foreign language.

In short, studies of negative memories are especially scarce within the framework of a foreign language. In the third study of this thesis, the possible implications and nuances of using a foreign language in comparison to a native language to retrieve and process a negative memory will be addressed.

## **1.4 Reasons to start this research**

It is essential to explore all new strategies that might offer useful results and that can be incorporated for the benefit of therapy and the patient comfort. For instance, anxiety disorders are emotionally and economically costly and will affect 25% of the population during their lifetime (Kessler et al., 2004). Any type of contribution that improves the treatment rejection and abandonment rates can be a good

contribution. From the point of view of language, and on the basis that language is the fundamental means of communication in the vast majority of psychotherapeutic techniques, it can be modulated from different perspectives to take advantage of its use. The fact that in psychotherapy it is not so frequent to initiate or use more than one language during treatment when therapist and patient are bilingual, opens up questions that in turn, open up ways to act and to look for new tools. In this case, we refer here to the use of a foreign language as a possible tool to incorporate in some parts of the therapy. In this sense, this project tries in some way to provide indications of a possible use of a foreign language, on the basis of the so called foreign language effect, to explore these possible uses. To say the least, to explore what impact this effect can have in certain areas of psychotherapy and in certain paradigms in particular.

In relation to the paradigms presented, fear extinction followed in the wake of the study of fear acquisition, both grounding a wide area within the psychotherapeutic field. The idea behind the use of these paradigms would be to be able to use the foreign language in the early stages of exposure, as a less aversive way, and then progress to using the first language. Following that line, exposure to a phobic stimulus as a closer step to a therapeutic environment. And then, within the context of stressful autobiographical memories, an environment that seems conducive to explore the effects of foreign language according to the literature of clinical cases in the therapeutic environment and the evidence that has given this effect in areas such as decision making among others. There are still many aspects that need exploration to test the influence of a foreign language, particularly in psychotherapy. The conclusions of the present thesis

could be used as key indications to guide future studies in the same line.

According to the literature presented in this introduction and the antecedents related to the effect that a foreign language can have on our emotions, the hypotheses of the studies followed that line. Overall, the aim of this thesis is to explore the influence of foreign language use on emotion regulation processes related to psychotherapeutic paradigms. The specific hypothesis and expected results are developed and further explained in each experiment below.



## 2. CHAPTER I. Languages and Psychotherapy: The Effect of Foreign Language in Fear Extinction

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# Languages and Psychotherapy: The Effect of Foreign Language in Fear Extinction

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**Background:** Using a foreign language can influence emotion modulation, but whether different psychotherapy processes would be affected by a foreign language is still unclear. The current study explored the foreign language effect in the extinction of fear.

**Method:** During the conditioning phase, part of the neutral stimuli presented to the participants were associated with a threat, while they

performed a countdown task in their native language. In the extinction phase, participants performed the same task either in their native/foreign language and were informed that the threat would no longer appear. We collected self-reports of fear, and pupil dilation and electrodermal activity as physiological measures of arousal.

**Results:** Extinction was successful, indexed by greater self-reported fear and pupil dilation during the threat condition compared to neutral in the conditioning phase, but no significant differences during extinction. Although the foreign language group presented higher arousal, fear extinction occurred irrespective of the linguistic context.

**Conclusions:** Fear extinction via verbal instructions is equally effective in a foreign and in a native language context. These results represent an invitation to continue gathering evidence on the role of foreign languages using basic paradigms with clinical applications.

**Keywords:** Foreign language, bilingualism, fear extinction, conditioning, fear, emotions

## **Introduction**

Human beings are in constant need of modulating their feelings and emotions. It has long been appreciated that language is greatly involved in many approaches to regulate these feelings. Individuals are driven to reconfigure their emotional states into some form of language, whether written or spoken. Traditional research shows that verbalizing highly emotional experiences in any form reduces the emotional response (Pennebaker & Chung, 2011 for a review). Language has been stated as a major form of communicating and embodying emotions. There are many techniques used in psychotherapy that are based on language as a vehicle to improve the



patient's condition, including emotion regulation strategies (Gyurak et al., 2009), retrieving of traumatic memories (Schrauf, 2000), or mainly any strategy that pursues re-framing the patient's thoughts to transform its emotions within the cognitive behavioural therapies. Likewise, language can be strategically used by opting for a non-native language (e.g., foreign) to perform these same psychotherapeutic techniques. In a situation in which a patient could use a different language to undergo a psychotherapeutic process, the question that arises is whether it is possible to receive therapy in a foreign language with the same efficacy. Here we propose a scenario in which participants are exposed to aversive stimuli after a process of conditioning, and they are asked to perform a task in two languages (native vs foreign) during a process of extinction. Thus, we assessed how using a foreign language modulates the extinction of fear, following exposure therapy as a widely used strategy in psychotherapy.

The use of a foreign language has highlighted some astonishing effects in different fields that raise doubts about how a non-native linguistic context would affect an area that involves high emotional content, such as psychotherapy. There are some prominent examples in literature that show how the use of a non-native language in bilinguals involves a decrease in emotionality in comparison to the native one (e. g., Caldwell-Harris & Aycicegi-Dinn, 2009; Harris et al., 2003). This effect is referred to as the 'foreign language effect'. Using the native language seems to be the natural choice when attending therapy. However, studies show indications of the possible use of a foreign language to address specific parts of the therapeutic process. Particularly, clinical cases have reported bilingual patients' preference for using their second language when retrieving painful memories or

coping with negative emotions (e.g., Movahedi, 1996; Pitta et al., 1978). Indeed, a second language even showed, in some cases, a softer response when rating the intensity of negative symptoms and traumatic memories (Schwanberg, 2010). These results reveal that using a native language was usually associated with a stronger and rawer emotionality than a non-native language, which could be perceived as more distant and safer (Aragno & Schlachet, 1996). Even language switching has been considered as an appropriate and effective strategy in the context of bilingual or multilingual therapy. Buxbaum (1949) already depicted the voluntary language switch in the clinical setting as a form of positive defence used by the patients to decrease their anxiety levels. In this line, Rosenblum (2011) portrays switching languages as an organic event occurring within a multilingual session, aligned with the reality of multilingual contexts in which voluntary code-switching occurs spontaneously (see de Bruin et al., 2018, 2020).

At a later stage, this differential effect between the emotionality in a native and a non-native language emerged in the decision-making field in the form of more deliberative reasoning and more rational choices in the foreign than in the native tongue (e.g., Costa et al., 2014; Keysar et al., 2012). This phenomenon has also been observed in other empirical studies beyond decision making, exploring different emotional linguistic materials in tasks involving emotional words or phrases (Anooshian & Hertel, 1994; Caldwell-Harris & Ayçiçeği-Dinn, 2009). The mechanisms behind this type of effects are still unclear, and it is unknown whether they are due to a decrease in emotionality or to an increase in the cognitive resources involved because of a greater cognitive load (see Geipel et al., 2016 for

a discussion). Nonetheless, what is important is the differential effect between languages, perceived as a psychological distancing from the object or situation to be confronted, and which is manifested through different physiological and behavioural responses.

More recent studies include physiological measures, which have enlightened the impact of this effect at an objective level. Iacozza, Costa and Duñabeitia (2017) presented emotional sentences in the native and the foreign language to bilingual participants and recorded their autonomic responses associated with pupil dilation. Their study showed that reading aloud sentences with a negative content (vs neutral sentences) in the foreign language elicited lower pupil size changes in comparison with completing the same task in the native language, suggesting a reduction of the emotional impact of negative sentences when they were read in the foreign language.

In psychotherapy, only a few studies have explored this foreign language effect. Recent research tested the effects of the use of a foreign language on some emotion regulation strategies through self-reports, obtaining that the use of a foreign language could be differentially beneficial depending on the strategy and finding a more advantageous effect for the content labelling strategy (see Morawetz et al., 2017). Additionally, some precursor experiments have explored the impact of emotional processing through fear conditioning in underlying semantic mechanisms, showing that fear generalized from one language to the other (native or foreign; Grégoire & Greening, 2019). However, there is a notable lack of investigation regarding the use of a non-native language in psychological paradigms. Further research is needed to ascertain the role of language nativeness in

clinical practice under the assumption of a reduced emotional attachment to foreign languages than to native languages.

Given the critical role that language plays in some psychotherapeutic paradigms and the effects that foreign language use can have on emotionality, recent research has focused on the impact of the foreign language effect on processes underlying exposure therapy. Exposure therapy is one of the most used and effective treatments for anxiety disorders. This method is described as the set of strategies in which the feared object (external or internal) is repeatedly approached rather than avoided (Craske, et al., 2018). The repeated exposure to aversive stimuli has been shown to be effective in research (Tabibnia et al., 2008) and effective in a second language context (Morawetz et al., 2017). One of the main processes underlying exposure therapy is fear conditioning. This paradigm consists of presenting a neutral stimulus, which becomes a conditioned stimulus (CS) after the paired and repeated presentation of an unconditioned stimulus (US), usually an electric shock. The result is a conditioned response of the CS. A subtype of fear conditioning through verbal instructions was referred to by Mechias et al. (2010) as instructed fear. In this type of conditioning, the stimuli are “conditioned” through verbal threats without the need for the actual presence of the US (see Mertens et al., 2018 for a review).

A first experiment conducted by our team (García-Palacios et al., 2018) explored the foreign language effect within an instructed fear paradigm. The results from this experiment showed that the linguistic context had an effect on the acquisition of fear. The foreign language diminished the acquisition of fear, showing more reduced pupil and electrodermal responses to conditioned stimuli (compared

to neutral ones) in the foreign than in the native language. These results were explained in terms of the emotional distance elicited by a foreign language, which could work as a fear reducer during the acquisition process. This finding opened doors to the possibility of a foreign language functioning as a useful tool in clinical contexts such as exposure therapy, in which a foreign language could produce the same detachment effect. Thus, a logical next step in this line of research was to explore another related process analogous to exposure therapy in a laboratory context: fear extinction. Extinction of fear consists of the presentation of a conditioned stimulus (CS), previously paired with an aversive stimulus (unconditioned stimulus, US), repeatedly presented without being followed by the US, resulting in a decline of the conditioned fear responses.

Based on the preceding results in the effects of conditioning instructions on fear in a foreign language context by García-Palacios et al. (2018), here we present a new study to investigate the role of a foreign language and its associated psychological distance in the instructed extinction process. For this purpose, conditioned fear was induced in participants in their native language. Next, an instructed extinction paradigm in native vs foreign language was used to eliminate that fear, simulating a course of exposure to a threat. For assessing the effectivity of the extinction, we included self-ratings of fear, and pupil size and electrodermal activity (EDA), two measures of physiological arousal, as arousal has shown to be modulated by the foreign language effect (Fernández-López & Perea, 2020). Hence, our goal was to test whether the process of instructed extinction fear was affected by the use of a foreign language differently than in a native language. According to previous literature supporting the foreign

language effect, we hypothesized that participants who used a foreign language in the extinction phase would show reduced self-reported fear and physiological measures in comparison to participants who used their native language.

As previous evidence established a new path in research involving psychological therapies and bilingualism, our purpose is to gather evidence and contribute to broadening the possibilities within psychotherapies through the effect of foreign language. A better understanding of the influence of prominent factors in therapy, such as the potential use of a foreign language, might lead to the improvement of these techniques and different ways of modulating emotions, as well as exploring more extensively the nuances of the foreign language effect.

## **Method**

### **Participants**

A total of 58 students were recruited from an initial sample of 132 that showed interest in participating in this experiment. The majority of the participants were women ( $n = 42$ ), and they all had an intermediate/high level of self-perceived English proficiency. The following inclusion criteria were established: Spanish as mother tongue; relatively proficient level of English measured with the self-perceived level of knowledge; less than one year living in an English-speaking country; no psychiatric problem in immediate need of treatment; and no current alcohol or drug dependence. Sample size was calculated by G\*Power (Faul et al., 2009), with an effect size of 0.25 and a power of 0.80 for repeated measures within-between interactions, obtaining a sample size of 34. Twenty-eight participants

were randomly assigned to the native language context (16 females) and 30 to the foreign language context (25 females). After removing 21 participants from the analysis due to recording failure and because of lack of measurable EDA collection, the final sample was constituted of 37 participants (29 females). The participants were matched in age, income, anxiety levels (see Table 1) and education (all participants had a university level). Besides, the mean level of English did not differ between the participants assigned to each group. All participants gave consent after being informed, and the study was approved by Universitat Jaume I Ethical Committee (Ref. 25/2018).

**Table 1.** Participant’s characteristics in the native and in the foreign language groups (means and standard deviations).

	Language context		<i>p</i> value	<i>t</i>
	Native (n = 17)	Foreign (n = 20)		
Females (number)	11	18		
Age (in years)	22.9 (8.4)	21.1 (3.4)	.24	0.92
Money income (in euros)	2546 (1194)	2387 (1201)	.58	0.28
STAI-R (score)	20.8 (10.4)	22.3 (6.5)	.09	0.40
STAR-E (score)	14.6 (5.5)	16.9 (5.6)	.64	1.43
English level (score)	7.6 (0.8)	6.8 (1.2)	.26	1.8

### Instruments

The questionnaires completed before the experiment included a short sociodemographic survey which examined their level of education, income, and previous experience in other experiments, a self-perception test of their knowledge of English skills, and the State-Trait Anxiety Inventory (STAI; Spielberger et al., 1983). Participants’

English skills were assessed according to an adaptation from the LEAP-Q (Marian et al., 2007).

### **Procedure**

The experiment was carried out by 3 researchers. Researcher 1 was in charge of assessing the participants with the questionnaires. Once participants had filled out the questionnaires, they were guided to a quiet room where the experiment was conducted. This study used an instructed fear and instructed extinction paradigm, with three parts: training, conditioning, and extinction. After placing the EDA sensors in the index and middle fingers of their non-dominant hand and the calibration of the eye-movement recording camera, researcher 2 explained in the native language (i.e., Spanish) the training and conditioning phases. In the training phase, participants observed 10 gray squares with a superimposed countdown from 10 to 1. The task consisted of saying the numbers out loud at the pace of 1 second. They completed two trials, one in the native language (i.e., Spanish) and the other in the foreign language (i.e., English). In the next phase (namely, the conditioning phase), the electrodes corresponding to the electric shock were attached to the other wrist to accomplish fear conditioning in the participants, and the participants were informed that the series of trials presented would consist of two color conditions: blue squares and yellow squares. Participants were verbally instructed that one of the colors (CS+) could be followed by an aversive stimulus (US), consisting of the possibility of receiving an electric shock, while the other color (CS-) would not be associated with this threat. No electric shock was actually administered, despite the association made by verbal instructions. The colors were selected according to the RGB scale and matching saturation and luminosity to



avoid differences in pupil diameter. The association between color squares and the condition (threat/neutral) was counterbalanced so that half of the participants had the blue squares as the threat/neutral stimulus and the other half the yellow one. The trials started with a fixation cross for 10 seconds. After that, each colored square appeared on screen for 10 seconds. The interstimulus interval had a duration of 10 seconds. Colors were presented in a randomized order with a countdown from 10 to 1 superimposed on them, while participants had to say out loud the number at a pace of 1 second in their native language (i.e., Spanish). Each color was presented 10 times, so the instructed fear phase consisted of a total of 20 trials of 10 seconds each. (Note that this procedure mimics that of the original study by García-Palacios et al. (2018), with the only exception of the use of a single language – Spanish – during the conditioning phase). The language context manipulation was inserted in the last phase: the instructed extinction phase. In this part, participants were informed that the threat or unconditioned stimulus (US) would no longer follow the corresponding colored square or conditioned stimulus (CS) (Luck & Lipp, 2016). In this instructed extinction phase, the instructions were given by researcher 3 either in the native language or in the foreign language, depending on the experimental group assigned to each participant. Participants were informed in the corresponding language that there would be no shock in this phase, and the electric shock electrode was removed following previous research (e.g., see Luck & Lipp, 2015 for a review). The task was the same as the one in the instructed fear phase, consisting of 20 trials of 10 seconds each. However, the countdown was either in Spanish or English, according to the assigned language context group. Both phases were followed by

subjective levels of fear for each condition on a scale from 0 to 100 (e.g., “On a scale from 0 to 100, how much fear do you feel right now?”), being 0 no fear at all, and 100 extreme fear. Researcher 2 and researcher 3 roles were exchanged and counterbalanced across participants. The experimental session lasted around 50 minutes in total. This paradigm was previously used by Phelps et al., (2001) to demonstrate through neuroimaging techniques that instructed fear was possible with only verbal instructions, in the absence of a real aversive stimulus. During the debriefing at the end of the study, the participants were asked whether they had felt any electric shock and how many, and were explained that they were in a non-shock condition following García-Palacios et al., (2018).

**Table 2.** Means, standard deviations and confidence intervals by Language, Phase and Condition.

	Native Language						Foreign Language									
	Conditioning			Extinction			Conditioning			Extinction						
	Mean (SD)	Lower	Upper	Mean (SD)	Lower	Upper	Mean (SD)	Lower	Upper	Mean (SD)	Lower	Upper				
	95% CI			95% CI			95% CI			95% CI			<i>t</i> (19)	<i>p</i>		
<b>Self-reports</b>																
<b>Neutral</b>	26.23 (6.01)	14.03	38.43	16.35 (6.14)	3.87	28.83	1.44	.09	17 (5.53)	5.75	28.24	19.85 (5.66)	8.34	31.35	1.10	.14
<b>Threat</b>	46.17 (6.35)	33.28	59.07	24.88 (6.46)	11.76	38	3.37	.002	33.35 (5.85)	21.46	45.23	20.95 (5.95)	8.85	33.04	2.50	.01
<b>Pupil size (mm)</b>																
<b>Neutral</b>	0.32 (0.48)	0.23	0.42	0.28 (0.45)	0.19	0.37	2.27	.19	0.43 (0.04)	0.34	0.52	0.46 (0.04)	0.37	0.54	0.80	.22
<b>Threat</b>	0.45 (0.5)	0.34	0.56	0.25 (0.43)	0.16	0.34	4.42	<.001	0.51 (0.05)	0.4	0.61	0.43 (0.04)	0.35	0.51	3.21	.002
<b>Electroderma I activity (µs)</b>																
<b>Neutral</b>	0.02 (0.02)	-0.01	0.06	0.03 (0.02)	-0.01	0.08	0.44	.33	0.03 (0.02)	-0.01	0.07	0.05 (0.02)	0.01	0.1	1.97	.03
<b>Threat</b>	0.04 (0.05)	-0.06	0.15	0.03 (0.02)	-0.02	0.08	0.24	.41	0.14 (0.05)	0.04	0.24	0.05 (0.02)	0.01	0.1	2.44	.01

## Data analysis

In order to test the effects of language context on self-reports of fear, a 2 (Phase: conditioning, extinction) x 2 (Condition: threat, neutral) x 2 (Language: native, foreign) repeated measures ANOVA was performed with Phase and Condition as within-subject factors and Language as between-subject factor. For EDA and pupil diameter, two separate 2 (Phase) x 2 (Condition) x 10 (Time: range 1 to 10) x 2 (Language) repeated measures ANOVAs were performed with Phase, Condition and Time as within-subject factors, and Language as between-subject factor. Partial eta squared ( $\eta_p^2$ ) was reported as a measure of effect size. Means (*SD*) and confidence intervals by Phase and Condition are reported in Table 2. Assumptions of normality, homoscedasticity, sphericity and equality of variances were explored using the Mauchly test and the Greenhouse-Geisser correction was used where appropriate. Post-hoc comparisons were performed with pairwise t-tests using Cohen's *d* as a measure of effect size. All statistical tests were conducted using SPSS IBM Statistics version 23 and graphs were made with R (R Core Team, 2020).

Pupil size (Tobii Pro Lab) and EDA (Shimmer3 GSR) were registered as physiological measures. Emotional arousal is significantly related to pupil dilation, especially negative emotions such as fear, which have been reported to have a stronger influence on the increasing or decreasing size of the pupil (Bradley et al., 2008; Hess & Polt, 1960). Skin conductance is also a key indicator of automatic emotion responses (see Kreibig, 2010 for a review). Mean pupil size was averaged across both eyes and reduced to 1-second-bin periods across the 10-seconds countdown presentation estimated for each

participant in each trial. The eye-tracker collected the data using a sampling rate of 120 Hz. EDA values were calculated as a mean amplitude of each second. Then mean EDA was also calculated for the whole 10-seconds and simultaneously recorded at a sampling rate of 125 Hz. Tobii Pro Lab apparatus applied a filter with a time window of 500 ms and then a mean filter with a time window of 1000 ms to remove rapid-transient artefacts and high-frequency noise. Then, the electrodes were placed in the middle fingers of the non-dominant hand and remained steady for two minutes until the signal stabilized. To obtain the baseline for both measures, the means were averaged across the 4 seconds before each trial, and the change scores were computed as the difference between each second of the trial and the baseline (see also García-Palacios et al., 2018). The percentages of change were calculated for both measures by averaging the data of each trial in each condition with respect to the baseline. The ten seconds of countdown were reduced to the mid optimal value of the mean as a reference mark for the whole trial.

**Table 3.** Results of main effects and interactions of pupil size and electrodermal activity

	Pupil size			Electrodermal activity		
	<i>F</i>	<i>p</i>	$\eta_p^2$	<i>F</i>	<i>p</i>	$\eta_p^2$
<i>Main effect Phase</i>	20.22	<.001	.36	0.93	.34	-
<i>Main effect Language</i>	6.38	.02	.15	1.14	.29	-
<i>Main effect Time</i>	100.07	<.001	.75	8.90	<.001	.20
<i>Main effect Condition</i>	1.20	.28	-	3.15	.09	-
<i>Phase x Language</i>	7.87	.01	.18	0.71	.40	-
<i>Phase x Condition</i>	22.96	<.001	.40	3.67	.06	-
<i>Phase x Time</i>	7.26	.03	.17	0.32	.66	-
<i>Language x Condition</i>	0.16	.68	-	2.08	.16	-
<i>Language x Time</i>	2.50	.10	-	1.49	.24	-
<i>Condition x Time</i>	3.00	.04	.08	1.92	.16	-
<i>Phase x Language x Condition</i>	1.07	.31	-	1.70	.20	-
<i>Phase x Language x Time</i>	9.89	<.001	.22	0.37	.62	-
<i>Phase x Condition x Time</i>	9.91	<.001	.22	3.75	.04	.10
<i>Language x Condition x Time</i>	0.33	.76	.01	1.63	.21	-
<i>Phase x Language x Condition x Time</i>	1.57	.18	.04	0.91	.39	-

## Results

### Self-reports of fear

The results for the repeated measure ANOVA for self-reported fear showed main effects of Phase [ $F(1, 35) = 10.17, p = .003, \eta_p^2 = .23$ ] and Condition [ $F(1, 35) = 11.57, p = .002, \eta_p^2 = .02$ ]. However, Language main effects were not found [ $F(1, 35) = .675, p = .42$ ]. In addition, the interaction between Phase x Condition was significant [ $F(1, 35) = 12.10, p < .001, \eta_p^2 = .26$ ]. Specifically, post-hoc analyses showed that participants reported greater fear in the threat compared to the neutral condition in the conditioning phase [ $t(36) = 4.06, p < .001, d = .69$ ], whereas there were no differences between threat and neutral conditions in the extinction phase [ $t(36) = 1.43, p = .08$ ]. These results were irrespective of the Language, being all the interaction analyses with this factor not significant (all  $p$ 's  $>.10$ ).

### Pupil size

Main effects for pupil size are presented in Table 3. Regarding interactions, the interaction Phase x Condition was significant [ $F(1, 35) = 22.96, p < .001, \eta_p^2 = .40$ ]. Specifically, post-hoc comparisons showed that, in the conditioning phase (see Figure 1A), pupil size was greater during the threat condition [ $t(36) = 2.49, p = .01, d = .45$ ] as compared to the neutral condition. However, differences between conditions in the extinction phase (see Figure 2) were not found [ $t(36) = .86, p = .20$ ]. In addition, Language interacted with Phase [ $F(1, 35) = 7.87, p = .01, \eta_p^2 = .18$ ]. In particular, the native-language group showed greater pupil size in the conditioning phase, compared to the extinction phase [ $t(16) = 4.60, p < .001, d = .78$ ], whereas the foreign-language group did not show differences between the phases [ $t(19) = 1.27, p = .11$ ]. Importantly, the three-way interaction Phase x Time x

Language was significant [ $F(3, 112) = 9.89, p < .001, \eta_p^2 = .22$ ]. Post-hoc comparisons showed that participants in the native-language group showed larger pupillary responses in the conditioning compared to the extinction phase from 2 to 10 seconds [second 2,  $t(16) = 3.84, p < .001, d = .68$ ; second 3,  $t(16) = 4.89, p < .001, d = .81$ ; second 4,  $t(16) = 4.77, p < .001, d = .83$ ; second 5,  $t(16) = 5.11, p < .001, d = .87$ ; second 6,  $t(16) = 4.75, p < .001, d = .85$ ; second 7,  $t(16) = 4.66, p < .001, d = .81$ ; second 8,  $t(16) = 4.45, p < .001, d = .74$ ; second 9,  $t(16) = 4.53, p < .001, d = .64$ ; second 10,  $t(16) = 4.16, p < .001, d = .71$ ], whereas participants in the foreign-language group showed differences between Phases only in four points [second 1,  $t(19) = 2.48, p = .01, d = .41$ , second 2,  $t(19) = 2.53, p = .01, d = .30$ ]; second 3,  $t(19) = 2.19, p = .02, d = .25$ ], second 10,  $t(19) = 2.85, p = .01, d = .28$ ]. The interaction Phase x Condition x Time x Language was not significant [ $F(4, 140) = 1.58, p = .18$ ].

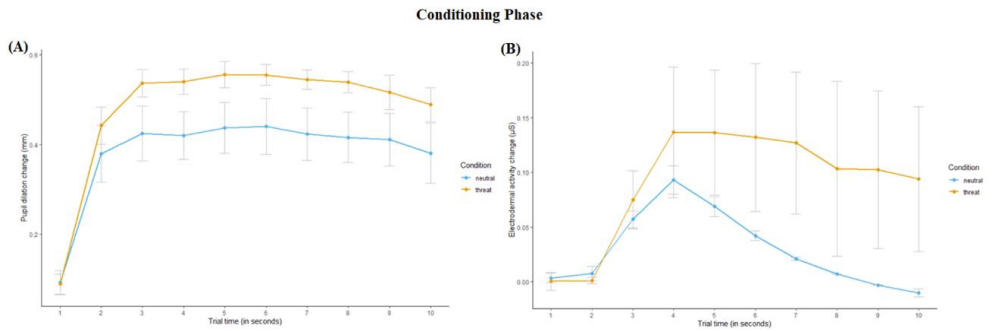
### **Electrodermal activity**

The analyses performed for EDA showed that the interaction Phase x Condition x Time was significant [ $F(1, 54) = 3.75, p = .04, \eta_p^2 = .10$ ] (see Figure 1B). Post-hoc comparisons revealed that, during conditioning, the threat condition produced greater levels of EDA compared to the neutral condition [second 6,  $t(36) = 2.08, p = .02, d = .40$ ; second 7,  $t(36) = 2.35, p = .01, d = .46$ ; second 8,  $t(36) = 1.83, p = .04, d = .37$ ; second 9,  $t(36) = 2.01, p = .02, d = .39$ ; second 10,  $t(36) = 1.95, p = .03, d = .34$ ]. However, in the extinction phase (see Figure 3), differences between threat and neutral conditions were not found in any of the time points (all  $p$ 's  $> .20$ ), indicating an effective extinction



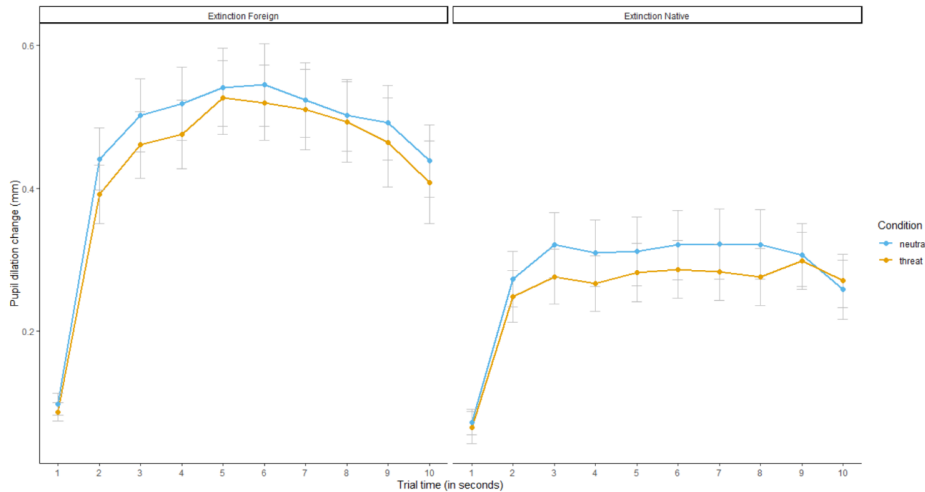
of fear. None of the interactions with Language were significant (all  $p$ 's  $> .20$ ). See Table 3 for other statistical results.

**Figure 1.** Pupil size (A) and electrodermal activity (B) change in the conditioning phase.

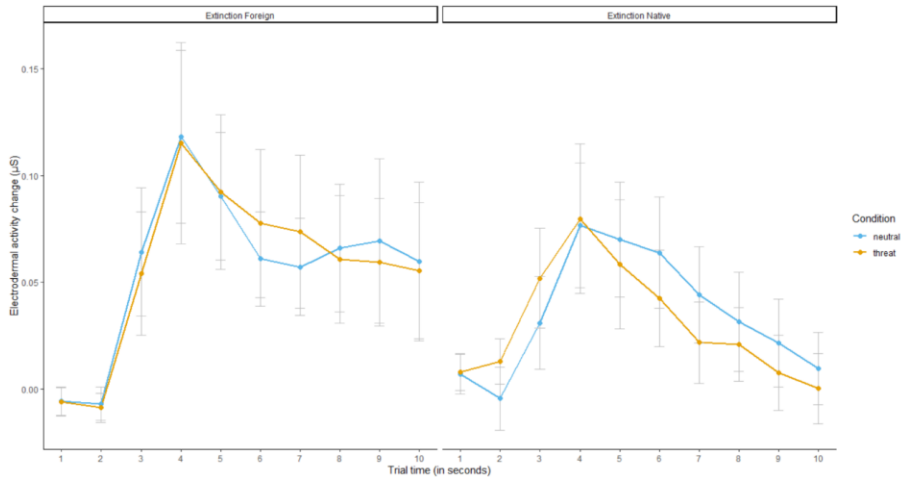


**Note.** (A) Pupil change over the 10 seconds countdown. (B) Electrodermal activity change over the 10 seconds countdown.

**Figure 2.** Pupil size change in the extinction phase by language and condition.



**Figure 3.** Electrodermal activity change in the extinction phase by language and condition.



## Discussion

The present study belongs to a line of research that aims to study the effect of a foreign language on instructed fear processes. Specifically, this study explored whether a foreign language could influence the extinction process of fear in bilinguals with a non-native level of proficiency in their foreign language. We approached this issue by using verbal instructions to accomplish the acquisition of fear and then the extinction of that fear in a group of Spanish-English bilingual participants. We assessed whether a foreign language could decrease the emotional reactivity evoked by a threat produced by the possibility of receiving electric shocks with physiological and self-reported fear-related measures. The results of this study showed that the process of

extinction did not differ depending on the language context in which it occurred. In fact, the extinction effect was effective in both languages. Particularly, the effect of the instructions in the extinction phase is clearly visible in the pupil size and electrodermal responses, showing a decrease in threat after the extinction instructions in both languages. The results also show overall higher arousal in the foreign language group.

The reduced fear effect found in the acquisition phase in the study by Garcia-Palacios et al., (2018) is not found in the extinction phase tested in the current study. Based on these findings, it seems that the effect of using a foreign language may be more relevant in acquisition than extinction processes. As previous studies suggested (Caldwell-Harris, 2015; Corey et al., 2017), reduced emotional involvement in a foreign language could be softening the process of acquisition. However, this effect does not seem to be as relevant in the extinction process. This is consistent with literature signaling that the foreign language effect is present in dilemmas or situations that only affect us at a personal level (Brouwer, 2021), since the extinction process entails new learning that no longer includes the association with an emotional stimulus, as it does during conditioning. Other studies highlight the emotionality of the situation as an important factor, showing stronger effects in the foreign language when the context is emotionally negative (Caldwell-Harris & Aycicegi-Dinn, 2009). Hence, we tentatively suggest that instructions implying negative emotional content, as is the case in the conditioning, would be a suitable context to see the presence of the foreign language effect, being less receptive to instructions about safety, as occurs during extinction.

The paradigm implemented in the current experiment has been used in previous instructed fear and instructed extinction studies to prove higher-order knowledge shaping aversive learning (Atlas, 2019; see Mechias et al., 2010 for a review). To date and to the best of our knowledge, no preceding study has introduced the language context variable in the extinction of fear. In this sense, it is important to note that our results showed an effective acquisition of fear and a satisfactory extinction phase. Both pupil and electrodermal responses showed differences between neutral and threat conditions in the acquisition phase, whereas these differences vanished in the extinction phase, thus showing an effective fear extinction regardless of the language context. Likewise, fear self-reports were in line with the physiological measures, presenting slightly higher reports in the acquisition phase compared to the extinction phase and reflecting the effectiveness of extinction by showing no significant differences between threat and neutral conditions. Therefore, we can confidently conclude that the lack of differences between language contexts in the extinction phase was not due to ineffective fear conditioning.

A crucial result is the general enhancement of arousal in the foreign language, with generalized larger psychophysiological effects in the extinction phase in the foreign than in the native language across conditions. The higher arousal in a foreign language during the extinction is due to the arousal associated with a non-native language. A reasonable explanation of this enhancement of arousal in a foreign language is the additional cognitive load experienced in a non-native language, which together with the higher cognitive fluency in the native language, could contribute to the observed differences (Costa et al, 2017). In this line, previous research has associated this increased

cognitive load effect with the higher attentional resources dedicated to developing a task in a language that is not the mother tongue (Alnæs et al., 2014; Duñabeitia & Costa, 2015). In this experiment, we overcome this issue by focusing on the index that signals the differences between threat and neutral stimuli in each phase (see Lonsdorf et al., 2017).

Pupil size has previously shown high sensitivity in capturing differential arousal levels associated to the use of different languages (e. g., Iacozza et al., 2017). This study showed stronger results in pupil size than in EDA, as in the previous acquisition study, although we have no certain explanation for this. Still, both physiological measures capture the effect more markedly than the self-reports (see also Iacozza et al., for a parallel situation). In this study, there is a limited collection of self-ratings, only at the end of each phase, so perhaps including more report points could extend the results. Still, it is worth noting that other studies showed this same pattern, obtaining the effect in physiological measures but not in the self-reports (Eilola & Havelka, 2011).

These results lead us to tentatively propose an ideal therapeutic scenario for a bilingual patient in which the main language is a foreign one. Obviously, such a recommendation would only apply in a clinical situation where an individual who is relatively fluent in a foreign language is set with a native-like bilingual practitioner, but these results anticipate a possible application of this dynamic in this and other paradigms in a therapeutic setting. Future research should explore this issue in further detail, and some limitations should also be considered. First, the possible influence of switching languages at the beginning of the extinction phase should be investigated. Although prior evidence

in decision-making has shown that switching languages does not weaken the foreign language effect (Corey et al., 2017; Oganian et al., 2016), it should be kept in mind that one of our test groups switched the language, while the other did not, and the potential impact of this should be further explored. And second, a cautionary note should be made concerning the proficiency level attained in the participants' foreign language. Although the literature points to a non-native-like proficiency level (such as the one chosen in this study) as ideal for observing foreign language effects, the proficiency level of comprehension in the non-native language could be another possible factor influencing the foreign language effect in this context. Replicating the current results with distinct types of bilinguals would be useful for generalization purposes. This is particularly relevant considering that preceding studies have highlighted the role of immersion, the level of involvement with a language and the between-languages similarity as potentially modulating factors (see Čavar & Tytus, 2018; Driver, 2020; Dylman & Champoux-Larsson, 2020). Finally, it is important to note that language use per se has been relatively limited in this study. Future studies should include more language involvement to more accurately explore how each language influences results.

To sum up, the foreign language effect does not modulate the strategy of fear extinction in terms of emotional reactivity of arousal when the absence of the threat is verbally communicated. Fear extinction via verbal instructions in a foreign language context is as effective as in the context of a native language, demonstrated by self-reports and two physiological measures which offered evidence of a similar response pattern in both language contexts. The present

experiment continues expanding the impact of the language context and its boundaries using the fear extinction paradigm underlying the exposure therapy. These results represent an invitation to continue gathering evidence on the role of foreign languages in clinical practice across techniques and paradigms.

### **Conflict of Interest Statement**

The authors declare that this study was carried out without any personal, professional or financial relationship that could be interpreted as a conflict of interest.

### **Author Contributions**

AG-P, AC and JD developed the concept of the study and provided ideas for the study design. IO, VC and DC prepared the physiological measures devices and necessary material. IO and VC performed the experiment design in the software and implemented the data collection and testing of the participants with IJ. The data analysis and interpretation of the physiological measures was executed by JD and IJ, and the behavioral data were analyzed by IJ. IO elaborated the manuscript along with IJ under the supervision of AG-P.

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### **Availability of Materials**

The datasets analyzed for this study can be found in the Open Science Framework (OSF) Repository [https://osf.io/t8za7/?view\_only=4f73b563b7d64997a4db92834f915dfb].

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### 3. CHAPTER II. The effect of the foreign language on cognitive reappraisal during exposure to a phobic stimulus

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## **The effect of the foreign language on cognitive reappraisal during exposure to a phobic stimulus**

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### **Abstract**

The foreign language effect shows that emotional reactivity is reduced when we use a second language instead of our native one to address different situations. The present study aims to test whether the use of cognitive reappraisal could be influenced by the participant's language (native/foreign). For this purpose, a sample of 60 participants with subclinical phobia to cockroaches was exposed to several phobic and neutral pictures while they used cognitive reappraisal in their native or in a foreign language. Physiological measures (pupil dilation and electrodermal activity)

and self-reports of affective valence and arousal were collected. Results show an overall effectiveness of the strategy of reappraisal in both languages. Additionally, the use of a foreign language depicts a decrease in the affective negativity of the threat stimuli in terms of valence. The ratings of arousal also show a general higher arousal as an effect of the use of a foreign language. The present results suggest that using a foreign language could be advantageous to reduce negative emotionality by reappraisal. However, it could be a barrier for reappraising non-unpleasant pictures. Further studies should explore the foreign language effect in psychotherapy to open new ways of approaching different disorders.

**Keywords:** bilingualism, foreign language, reappraisal, emotion regulation, exposure therapy.

### **Funding**

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### **Introduction**

The diversity of languages is growing. Bilingualism or multilingualism in a foreign country is becoming common as mobility between countries increases. Being in a foreign language context frequently implies the search for resources in a non-native language. These resources, among many others, may be the need to seek mental health professionals. In the same direction, mental health disorders are increasing as well, especially anxiety disorders. As such, it has become usual and sometimes inevitable to treat these disorders in the language

of the host country. In a position in which someone needs to approach a phobia in a foreign language context, one could think that the treatment would not be as effective as if it were done in the native language. However, the use of a foreign language in areas such as decision-making (e.g., Cipolletti et al., 2016; Costa et al. 2014) and the acquisition of fear experiments (García-Palacios et al, 2018) have shown that the confrontation of negative emotional material in a second language reduces the emotional impact, and in consequence, it could facilitate the efficiency of some parts of the process.

The use of a non-native language to investigate affective processing has gained some focus in the past years (Pavlenko et al., 2012). Specifically, studies in areas such as decision making have pointed out how the use of a second language could affect processes involving moral choices differently (Costa et al., 2014) or the aversion to possible losses (Keysar et al., 2012). These studies found a pattern in which the decisions made in a foreign language resulted in more utilitarian and rational when confronting moral dilemmas, and the acceptance of gambles produced less aversion to losses, respectively. The second language had an impact on the results, causing a more deliberate and more impersonal reasoning and consequently more rational choices. This contrast under the influence of a non-native language was called the ‘foreign language effect’. Successive authors have discussed a plausible explanation for this phenomenon in emotional terms (Caldwell-Harris, 2015). Using a foreign language would imply a reduction in emotionality, evoking a psychological distance that would result in a ‘colder’ judgment compared to the familiarity of the native language. In this vein, a growing body of literature has focused on the influence of a second or foreign

language on affective processing (Geipel et al., 2016; Hadjichristidis et al., 2019). For instance, some studies presenting emotional words or sentences in the native and in a foreign language showed reduced impact in the later one (Caldwell-Harris, 2015; Jończyk et al., 2016). Essentially, the scientific literature has addressed this effect on different levels, subjective, physiological and neural (e.g., Harris et al., 2015; Iacozza et al., 2017). Some examples directly relate the foreign language effect to a decrease in emotional reaction through physiological measures. Bilingual speakers showed reduced skin conductance responses (SCR) when listening to emotional phrases in their second language (English), compared to their native one (Turkish), (Caldwell-Harris & Aycicegi-Dinn, 2009). There is also a decrease in arousal when hearing swear words measured by skin conductance (Harris et al., 2003), also shown in pupil size results (Iacozza et al., 2017). Iacozza and colleagues presented highly emotional sentences to a group of participants in the native and in their second language, obtaining via a diminished pupil size response that reading the sentences aloud in the second language dampened the emotional load of the sentences. They suggested lighter emotional processing in a second language in the context of reading emotional material. According to research, what generates this differential effect in a foreign language and makes it distinctive from the native one, is the higher cognitive load associated with the foreign language processing (Caldwell-Harris & Aycıçeği-Dinn, 2021). Specifically, it requires a greater lexical processing demand (Ivanova & Costa, 2008). In addition, Branzi et al., (2016) supported that using a foreign language leads a greater recruitment of neural areas involved with cognitive control.

The clinical setting has also shown a preference for a foreign language on some occasions, particularly when the content to be dealt with was emotionally charged (Dewaele, 2010; Marcos, 1976; Guttfreund, 1990). More importantly, clinical case studies with bilinguals provide evidence of psychotherapy in a foreign language being as effective as therapy in a native language (Griner & Smith, 2006). Also, in some cases a foreign language proved to be even more useful than native language to detach from traumatic childhood memories (Aragno & Schlachet, 1996). The intuition is that a foreign language can function as a protector, enabling patients to feel more distance when treating emotional experiences and, consequently, feel safer (Buxbaum, 1949; Movahedi, 1996).

More relevant to our research, one of the main strategies in the field of psychology which entail large linguistic change, are emotion regulation strategies. They are commonly used in the treatment of emotional disorders, among others, and are often combined with other therapeutic strategies like exposure therapy to cope with a particular fear that the patient may have. Interestingly, the emotion regulation strategies models are based on language whether transform, reinterpret and regulate people's emotions by verbally, mentally or writing procedures. These strategies contrast processes either implicitly (affect labeling) or explicitly (cognitive reappraisal) (Gyurak et al., 2011). Some studies provide evidence that explicit regulation strategies could approach the fearful object more efficiently, since the patient is aware of what he is doing (Beck et al., 2005) within the cognitive-behavioral therapy (CBT) in anxiety disorders. Koelsch et al., (2015) already posed that language can function as a form of emotional regulation through reappraisal. Particularly, the strategy of

reappraisal refers to the transformation or reinterpretation of the situation in order to alter its emotional impact (Gross, 1998). Thus, the strategy of reappraisal implies robust evaluation of the thought patterns in order to reinterpret its meaning (Richards et al., 2003). In addition, this strategy involves language, usually in the form of inner speech (Salas et al., 2018). Hence reappraisal seems to provide a good approach to explore the mechanisms of the foreign language effect in the regulation of emotions. Flykt and Bjärtå (2008) pointed out that the additional controlled processing of higher resource demanding tasks modulates fear responses, and reduces arousal in physiological responses. In this line, literature seems to suggest that people using reappraisal report feeling significantly greater affective valence and less arousal when faced negative stimuli, indexed by diminished electrodermal activity and pupil dilation (e.g., Burklund, et al., 2014; Ray et al., 2010; Shahane et al., 2019).

Even though clinical records have traditionally shown some preferences for a second language in relation to emotional issues, there is still a lot to understand concerning the use of emotion regulation strategies, especially taking into account certain disparity in the functioning of the foreign language effect in the clinical context. Morawetz et al. (2017) supported the view of some emotion regulation techniques can benefit from the foreign language effect. They reported that content labeling was more effective in a second language, while reappraisal showed not being dependent on the language context. A more recent study by Vives et al. (2021) found in a neuroimaging study higher activation of the amygdala when using affect labeling in a foreign language, suggesting that a foreign language does not reduce emotionality with this strategy. These studies suggest that the foreign

language effect could be an important factor in the regulation of emotions, yet it deserves further exploration.

With this background, certain doubts are raised so far in relation to the possible effect that the use of a foreign language can have on psychological strategies that deal with emotional issues. Previous studies of this line of research focused on the emotion of fear, and examined whether the foreign language effect influenced the acquisition and extinction of fear following an instructed fear paradigm in a series of experiments conducted by our team. The results concluded that the acquisition of fear was weaker in terms of physiological measures (skin conductance and pupil dilation) in a foreign language context (García-Palacios et al., 2018). However, this effect was not shown in the extinction process, resulting equally effective in both linguistic contexts (Ortigosa-Beltran et al., in press).

Due to the lack of research in the foreign language effect on psychotherapeutic processes as extinction and emotion regulation, here we aim to illuminate this area and go a step further. This study follows the line of a previous study where an extinction paradigm was used (Ortigosa-Beltran et al., in press), with the addition to a closer orientation to clinical practice. Specifically, the question it is attempted to address is whether using a different language modulates the efficacy of the strategy of cognitive reappraisal during a brief course of exposure to a fearful stimulus in people with subclinical phobia. We propose that the combination of effects of the strategy of reappraisal and the softener effect associated with the use of a foreign language help soften the levels of arousal when confronting fearful stimuli, as well as reduced unpleasant ratings. According to some examples in literature, we predict greater baseline arousal in the foreign language

group in comparison with the native group due to the additional cognitive load (Alnaes et al., 2014). Additionally, we expect to find differences between regulation and non-regulation conditions. Specifically, we hypothesize that reappraisal will be associated with greater valence self-reports, as well as reduced arousal self-reports, and diminished physiological responses (pupil size and electrodermal activity), being these differences greater in the foreign group due to the distance associated with this language.

## **Method**

### **Participants**

Sixty participants (49 females, mean age = 22.31 years, SD = 2.73) were recruited from an initial sample of 248. The participants scored between the second and the third quartile on the Cockroaches Phobia Questionnaire (M = 67.01, SD = 31.22), adapted from the Spider Phobia Questionnaire (Klorman et al., 1974) in order to select the participants with innate rejection to the negative images presented. Participants had an intermediate/high level of English according to an adaptation from Marian et al., (2007). All participants gave informed consent and were compensated with six euros. The inclusion criteria were: Spanish as mother tongue; relatively proficient level of English measured with a self-perceived level of knowledge; less than one year living in an English-speaking country. The exclusion criteria were to have no psychiatric problem in immediate need of treatment; and no current alcohol or drug dependence. All participants had normal or corrected-to-normal vision and completed several questionnaires prior to the experiment. These questionnaires included a short sociodemographic questionnaire which examined their level of



education and income, a questionnaire to explore anxiety trait and state (State-Trait Anxiety Inventory; STAI; Spielberger et al., 1983), a questionnaire for depression symptoms (BDI-II; Beck et al., 1996), and one for emotion regulation abilities (Emotion Regulation Questionnaire; ERQ; Gross & John, 2003). The participants were matched in age, education, income, anxiety levels, depression symptoms and emotion regulation strategies skills (see Table 1), and the number of participants per group and condition was similar (or above) to previous studies (García-Palacios et al. 2018).

**Table 1.** Participant’s characteristics in the native and in the foreign language groups (means and standard deviations).

	<b>Native (n = 30)</b>	<b>Foreign (n = 30)</b>
Females (number)	22	27
Age (in years)	23.31(2.9)	21.95(2.8)
English level	6.39(1.3)	6.46(1.42)
Phobia	66.86(29.8)	69.78(35.5)
Money income (in euros)	2187.50	2732.76
STAI-E	16.95(9.16)	14.32(7)
STAI-R	25.68(7.8)	16.91(6.86)
BDI-II	12.68(7.3)	8.86(6.4)
ERQ	38.77(6.4)	37.23(9.8)

Thirty participants were randomly assigned to the foreign language context (27 females) and 30 to the native language context (22 females). The mean level of English did not differ between the participants assigned to each group (see Table 2), nor did it differ between language skill types [Speaking:  $t(48) = -.25, p = .65$ ; Listening:  $t(48) = -.32, p = .65$ ; Writing:  $t(48) = -.62, p = .40$ ; Reading:  $t(47) = -.07, p = .81$ ]. Participants under 80% pupil validity (n=4) were excluded from the analysis, resulting in a group of 56 participants for

the final analysis of pupil size, being 29 in the foreign language group and 27 in the native one. The sample resulted in 56 participants for pupil dilation analysis, 60 for electrodermal activity analyses and 59 for subjective ratings. The study was approved by the ethics committee at author's university.

**Table 2.** Participant's basic language skills and age of acquisition in the native and in the foreign language groups (means and standard deviations).

	<b>Native (n = 30)</b>	<b>Foreign (n = 30)</b>
Speaking	5.52(1.6)	5.64(1.6)
Listening	6.44(1.78)	6.6(1.7)
Writing	6(1.9)	6.32(1.6)
Reading	6.92(1.9)	6.96(1.7)
Age of acquisition (years old)	6.16(1.8)	6.2(1.5)

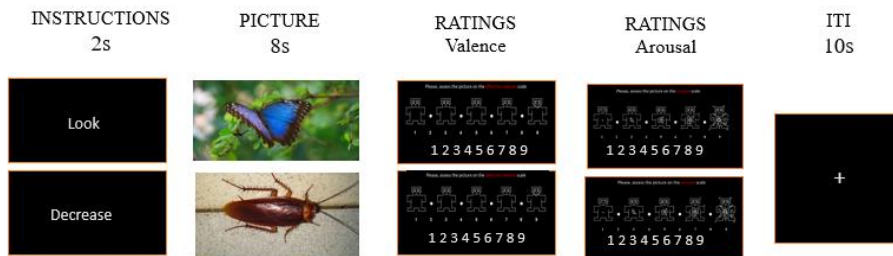
### **Stimuli and design**

Participants were randomly assigned to the language context prior to the beginning of the experiment. The task adapted the emotion regulation strategy of reappraisal in two language contexts during a brief course of exposure to negative and neutral pictures. A total of 40 trials were performed: 20 neutral (butterflies) and 20 negative (cockroaches). Pictures were chosen from the repository Grimaldos et al. (2021), using the normative values for affective valence and arousal in Spanish samples. Negative (valence:  $M = 2.01$ ;  $SD = 0.96$ ; arousal:  $M = 4.67$ ;  $SD = 1.55$ ); neutral (valence:  $M = 4.91$ ;  $SD = 0.97$ ; arousal:  $M = 3.93$ ;  $SD = 1.51$ ). These pictures were presented in a random order to both language context groups, equally associated with the conditions of 'reappraisal' and 'nonregulation'. Right before the experiment started, a reminder with the instructions appeared on the screen in the corresponding language for 10 seconds. The trial structure was similar to previous literature in emotion regulation

strategies and language (Langeslag & Van Strien, 2018; Morawetz et al. 2017). The beginning of each trial was a fixation cross for 10 seconds, 4 seconds of which served as a baseline for posterior analysis (see Figure 1). Following Bebko, Franconeri, Ochsner and Chiao (2011), the emotion regulation strategy cue was presented before the picture for 2 seconds, the cue 'Look' for the nonregulation items, and 'Decrease' for the reappraisal items, in the corresponding language. The instructions for the cue 'Look' were to simply view the picture on the screen without trying to avoid it or think of something else, only responding naturally to the stimulus, following previous studies (Fuentes-Sánchez et al. 2019; Jaen et al., 2021; Webb et al., 2012). The instructions for the trial cues with 'Decrease' were to keep in mind and say out loud the sentence 'It can not do anything to me' in the foreign language (English), and 'No puede hacerme nada' in the native language (Spanish), in order to reduce the intensity of the negative emotion. Generally, in monolingual studies using reappraisal the participants are trained to display a conscious and volitional strategy generating their own mental sentences to decrease the emotion (e. g. Daros et al., 2018; Fuentes-Sánchez et al., 2019). However, in this case we trained them to mentally go through the same reinterpretation, in both languages, with the purpose of having the same language content in both languages and to avoid the extra cognitive load in the foreign language group associated with the elaboration of a sentence in a non-native language. In addition, the reappraisal sentence was asked to be said out loud to avoid possible inner speech. Immediately after each cue, a picture stimulus was presented with a duration of 8 seconds. Afterwards, participants completed ratings of valence and arousal related to each picture according to the Self-Assessment Manikin

(SAM; Lang, 1980) thus providing a measure of trial-by-trial emotion regulation success. In this nine-point scale the valence figures ranged between an unhappy figure to a smiling happy one, while the arousal dimension ranged from a relaxed figure to an agitated, excited one. The report was made by saying out loud in the corresponding language the degree of arousal of valence self-assessed by the participant. The trial ended with an interstimulus interval (ITI) of 10 seconds of duration.

**Figure 1.** Trial design of the emotion regulation task.



### Psychophysiological data

The physiological measures recorded were the pupil size (Tobii Pro Lab) and the electrodermal activity (EDA; Shimmer3 GSR), both significant indicators of emotional charge in aversive stimuli. Pupil dilation has been shown to be a good measure of fear in the confrontation of fearful stimuli (Bradley et al., 2008; Hess & Polt, 1960), while the electrodermal activity is one of the main physiological measures in the automatic emotion responses (see Kreibig, 2010 for a review). The eye-tracker registered data at a sampling rate of 120 Hz. Images were displayed on a 19" monitor approximately 50 cm from the participants' eyes. The screen monitored the pupil and served to display the task to the participants. Preprocessing for pupil dilation was carried out with MATLAB, following the guidelines provided by Kret and Sjak-Shie (2019). The raw data was filtered to remove invalid

pupil size samples and artifacts and gaps in the sample were discarded, in order to obtain a smooth signal with valid data. Pupil size was averaged across both eyes and reduced to the mean value across the 8 second-trial. Electrodermal activity was recorded using a sampling rate of 125 Hz. Invalid data were removed in order to attain a continuous signal. Mean electrodermal activity was averaged for the 8-seconds trial. The electrodes were placed in the middle fingers of the non-dominant hand and remained steady for two minutes until the signal stabilized. The baseline for both physiological measures was calculated averaging the mean from the 4 seconds prior to each trial. The change scores were calculated as the difference between the mean of each trial in each condition and the mean of the baseline for both measures.

### **Procedure**

Participants completed online a self-perceived questionnaire related to their English level and a phobia to cockroaches questionnaire prior attending to the in person session, in order to see whether they fulfilled the inclusion criteria.

The session started with the participants reading the consent form and filling the questionnaires related to anxiety, depression, emotion regulation strategies and sociodemographic. Once the exclusion criteria were met, the participants were randomly assigned to one of the language conditions (native or foreign) and they were positioned in front of the computer screen where the experiment was carried out. The sensors of the electrodermal activity were placed in the middle and index fingers of the non-dominant hand remained there until the signal stabilized. Afterwards, the researcher explained the concept of emotion regulation strategies, focusing on the strategy

of cognitive reappraisal, with examples. The language context began when the participant started the task. Firstly, a screen with the instructions indicated to the participant that a cue with the relevant word instruction, 'Look' or 'Decrease', would precede a picture. The instructions explained the task in each condition, with the support of the researcher reinforcing the written instructions. They were also informed in the instructions that a screen with self-reports of valence and arousal would be shown at the end of each trial, and they would have to report verbally in the corresponding language condition the self-perceived degree of arousal and valence. After assuring that the participant had understood the instructions, an example trial was shown to the participant to see the structure of the task. Right before starting the task, the eyes of the participant were calibrated on the screen with the eye-tracker. Once the electrodermal activity signal was stable and the eye-tracking calibrated, the task started. When the participant finished the 40 trials of the task, the sensors were removed and they completed the formulary to receive the payment.

The whole session was conducted in the corresponding language group, including all the interactions, verbal and written instructions and items, in order to provide language consistency. The session consisted of 10/15 minutes of questionnaires and 20/25 minutes of task in the computer, lasting around 40/45 minutes in total.

### **Data analysis**

Four separate 2 (Stimulus Type: negative vs neutral) x 2 (Regulation Strategy: reappraisal vs non-regulation) x 2 (Language Context: native

vs foreign) repeated measures ANOVAs were performed for self-reported affective valence, self-reported arousal, pupil size, and electrodermal activity. Stimulus Type (negative vs neutral) and Regulation Strategy (Reappraisal vs non-regulation) were set as within-participant factors, and Language Context (native vs foreign) was set as a between-participants factor. Means and SDs are presented in Table 3. Assumptions of normality, homoscedasticity, sphericity, and equality of variances were explored using the Mauchly test and the Greenhouse-Geisser correction was used where appropriate. Additionally, post-hoc pairwise comparisons were performed using *t* tests to evaluate differences between stimuli types as well as between the reappraisal and non-regulation conditions when significant differences in main effects were found. Alpha level was set at 5% for the repeated measures ANOVAs and at 1% for *t* tests. Partial eta squared ( $\eta_p^2$ ) and Cohen's *d* were obtained as measures of effect size. All statistical tests were conducted using SPSS IBM Statistics version 23 and graphs were made with R (R Core Team, 2020).

**Table 3.** Means, standard deviations and confidence intervals by Language, Strategy and Condition.

	Native Language					Foreign Language						
	Look		Reappraisal			Look		Reappraisal				
	95% CI		Mean (SD)	Lower	Upper	95% CI		Mean (SD)	Lower	Upper		
<b>Valence self-reports</b>												
Neutral	6.94 (1.32)	6.45	7.43	7.23 (1.16)	6.75	7.71	7.04 (1.27)	6.55	7.52	6.69 (1.37)	6.21	7.17
Negative	2.93 (1.46)	2.44	3.43	3.05 (1.23)	2.62	3.48	2.36 (1.14)	1.88	2.85	2.65 (1.02)	2.23	3.07
<b>Arousal self-reports</b>												
Neutral	2.09 (1.24)	1.50	2.68	2.03 (1.10)	1.4	2.5	2.50 (1.80)	1.92	3.08	2.39 (1.70)	1.85	2.92
Negative	4.76 (1.92)	4.03	5.50	4.58 (1.77)	3.8	5.2	6.10 (1.96)	5.38	6.83	5.58 (1.90)	4.90	6.27
<b>Pupil size</b>												
Neutral	-15.58 (5.98)	-17.61	-13.55	-15.84 (5.59)	-17.68	-13.99	-19.44 (4.20)	-21.44	-17.45	-14.10 (3.58)	-15.91	-12.30
Negative	-18.66 (6.23)	-20.78	-16.54	-16.90 (6.42)	-19.09	-14.71	-19.52 (4.40)	-21.60	-17.44	-17.65 (4.57)	-19.80	-15.51
<b>Electrodermal activity</b>												
Neutral	-1.08 (1.32)	-1.74	-0.42	0.28 (1.23)	-0.40	0.97	-0.43 (2.16)	-1.12	0.24	0.63 (2.33)	-0.08	1.34
Negative	-0.32 (1.68)	-0.91	0.263	2.00 (3.18)	0.90	3.10	0.15 (1.47)	-0.46	0.76	1.73 (2.65)	0.60	2.87



## Results

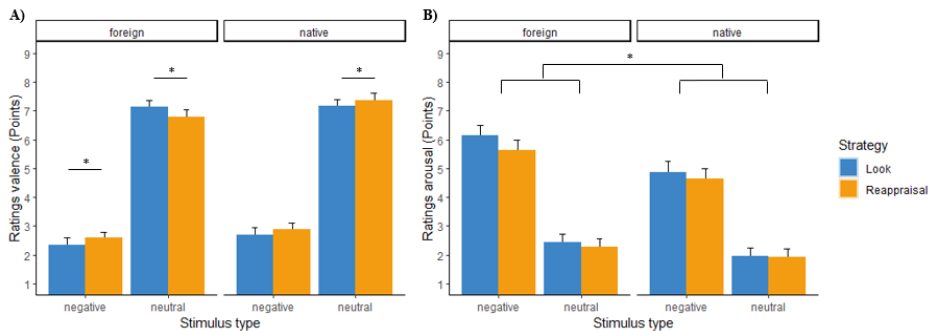
### Self-ratings

For valence self-reports, the main effect of Stimulus Type was significant [ $F(1, 55) = 63.99, p < .001, \eta_p^2 = .54$ ], but was not significant neither for Regulation Strategy ( $F < 1$ ) nor Language Context [ $F(1, 55) = 2.26, p = .11, \eta_p^2 = .08$ ]. Specifically, valence was rated lower for negative than for neutral stimuli. The repeated measures ANOVA did not reveal differences between Stimuli Type x Language Context ( $F < 1$ ), Regulation Strategy x Language Context [ $F(1, 55) = 2.13, p = .13, \eta_p^2 = .07$ ], nor Stimuli Type x Regulation Strategy ( $F < 1$ ). However, Stimuli Type x Regulation Strategy x Language Context was significant [ $F(1, 55) = 5.29, p < .01, \eta_p^2 = .16$ ]. Specifically, post-hoc comparisons showed that participants in the foreign context rated negative stimuli with greater valence when they use reappraisal compared to non-regulation [ $t(29) = 2.43, p = .01, d = .27$ ]. Also, they rated neutral stimuli with lower valence when they were instructed to reappraise compared to non-regulation [ $t(28) = 3.74, p < .001, d = 0.26$ ]. Participants in the native context reported greater valence when reappraising neutral pictures compared to non-regulation [ $t(27) = 3.00, p < .01, d = .23$ ], but no differences were found between reappraisal and non-regulation for negative pictures ( $t < 1$ ) (see Figure 2 A).

In terms of arousal self-reports, the main effect of Stimuli Type [ $F(1, 55) = 12.17, p < .001, \eta_p^2 = 0.18$ ] and Language Context [ $F(1, 55) = 3.69, p < .05, \eta_p^2 = .12$ ] were significant, while a main effect was not found for Regulation Strategy ( $F < 1$ ). Specifically, negative stimuli were rated as more arousing than neutral stimuli. In addition, people in the foreign context rated images as more arousing than

people in the native context. Interactions between Stimuli x Language ( $F < 1$ ) and Strategy x Language [ $F(1, 55) = 1.5, p = .23, \eta_p^2 = .05$ ] were not significant, as well as the interaction Stimuli Type x Regulation Strategy x Language Context ( $F < 1$ ) (see Figure 2 B).

**Figure 2.** (A) Ratings of valence per Condition (neutral and negative) and Regulation Strategy (non-regulation in blue, reappraisal in orange), in each language group (foreign on the left, native on the right). The scale ranges from 0 (negative) to 9 (positive). (B) Ratings of arousal per Condition (neutral and negative) and Regulation Strategy (non-regulation in blue, reappraisal in orange), in each language group (foreign on the left, native on the right). The scale ranges from 0 (low arousal) to 9 (high arousal).

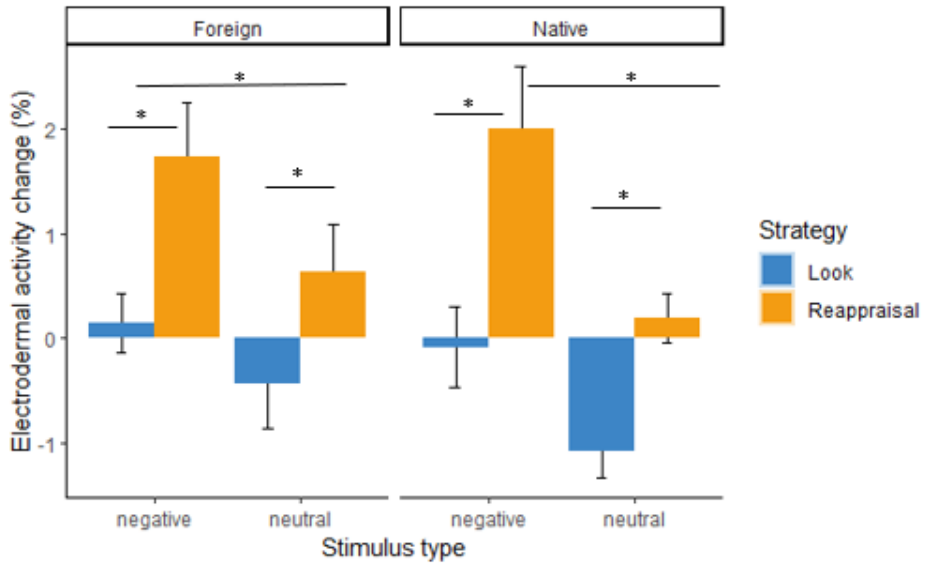


### Electrodermal activity

The overall repeated measures ANOVA revealed a significant main effect of Stimuli Type [ $F(1, 54) = 18.32, p < .001, \eta_p^2 = .25$ ] and Regulation Strategy [ $F(1, 54) = 28.52, p < .001, \eta_p^2 = .35$ ], but did not reveal a significant main effect of Language Context ( $F < 1$ ). Specifically, electrodermal activity responses were greater for the negative stimuli compared with the neutral stimuli. In addition, participants showed greater electrodermal activity responses when they used the reappraisal strategy compared to non-regulation (see Figure 3). Interactions between Stimuli Type x Strategy [ $F(1, 54) = 2.99, p = .08, \eta_p^2 = .05$ ], Stimuli Type x Language Context ( $F < 1$ ),

Strategy x Language Context ( $F < 1$ ), and Stimuli x Strategy x Group ( $F < 1$ ) were not significant.

**Figure 3.** Electrodermal activity change in each language group with respect to the baseline epoch by Strategy and Condition. Graph on the left corresponds to the Foreign language context and graph on the right corresponds to the Native language context. Blue bars correspond to the non-regulation strategy and orange bars correspond to the reappraisal strategy. Error bars represent the standard error.

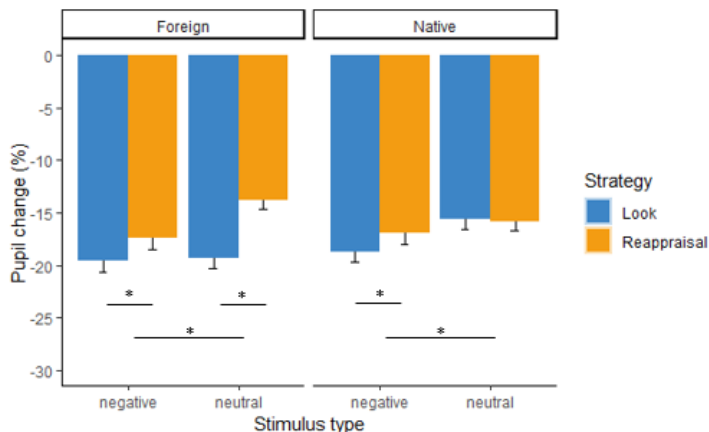


### Pupil size

A main effect was found for Stimuli Type [ $F(1, 51) = 31.98, p < .001, \eta_p^2 = .39$ ], and Regulation Strategy [ $F(1, 51) = 56.16, p < .001, \eta_p^2 = .52$ ]. However, the main effect of Language Context was not significant [ $F < 1$ ]. Specifically, neutral stimuli produce greater pupil responses compared with negative stimuli. In addition, the reappraisal strategy was associated with greater pupil responses compared with the non-regulate condition. Regarding the interactions, Stimuli x Strategy [ $F(1, 56) = 3.56, p = .07, \eta_p^2 = .07$ ] and Stimuli Type x Language [ $F < 1$ ] were not significant. However, the Strategy Type x Language Context interaction was significant [ $F(1, 51) = 24.06, p <$

.001,  $\eta_p^2 = .32$ ]. Specifically, post-hoc comparisons showed that effects of Strategy Regulation were not found for the native group [ $t(25) = 1.90, p = .04, d = .12$ ], while pupil responses were higher for the foreign group when reappraisal strategy was used compared to non-regulation [ $t(26) = 8.50, p < .001, d = .89$ ]. In addition, the Stimuli Type x Strategy x Language Context interaction was significant [ $F(1, 51) = 51.29, p < .001, \eta_p^2 = .50$ ]. As shown in Figure 4, the native group showed lower pupil responses during reappraisal compared to the non-regulation condition for the negative stimuli [ $t(25) = 3.6, p < .001, d = .28$ ], but differences were not found for neutral stimuli ( $t < 1$ ). The foreign group showed a significant effect of the Regulation Strategy for both negative [ $t(26) = 3.83, p < .001, d = .42$ ] and neutral stimuli [ $t(26) = 11.16, p < .001, d = 1.37$ ], being pupil responses lower when participants had to reappraise their emotions.

**Figure 4.** Pupil size change in each language group with respect to the baseline epoch by Strategy and Condition. Graph on the left corresponds to the Foreign language context and graph on the right corresponds to the Native language context. Blue bars correspond to the non-regulation strategy and orange bars correspond to the reappraisal strategy. Error bars represent the standard error.



## Discussion

This work follows a line of research that aims to explore the effect of the foreign language on processes involved in psychotherapy.

Specifically, the purpose of the current study was to examine whether the use of a foreign language on bilingual people with subclinical phobia had an effect on the use of reappraisal during a short period of exposure to a fearful stimulus. Thus, a series of negative (cockroaches) and neutral (butterflies) pictures were presented to participants with subclinical phobia to cockroaches while physiological and self-reported measures were collected. The task consisted of using either the reappraisal strategy or a non-regulation strategy in a random order, depending on the cue prior to each picture.

Overall, self-ratings of valence and arousal showed differences between pictures of cockroaches and butterflies. Similarly to previous studies using negative and neutral stimuli (Lang, Bradley & Cuthbert, 2008), negative pictures (i.e., cockroaches) were rated as less pleasant and more arousing than the neutral pictures (i.e., butterflies). In the same vein, electrodermal activity and pupil size response were greater during the visualization of cockroaches in comparison to butterflies, which is also associated with greater arousal during the visualization of negative pictures. For affective valence, these differences did not depend on the language context. For arousal, however, pictures of cockroaches were rated as more arousing, especially in the foreign language group. These results are in line with our prediction of a greater baseline arousal in the foreign language group in comparison with the native group. Based on previous literature, these differences are explained by the additional cognitive load (Alnaes et al., 2014). and higher anxiety associated with the use of a non-native language (MacIntyre et al., 1997) to regulate their emotions.

EDA also showed greater arousal when visualizing cockroaches, in contrast to pupil size response, which was higher

during the trials in which butterflies were presented, compared with cockroaches. However, we believe that the significant main effect obtained for the stimuli type has been driven by the paradigm used here. This is, means for both stimuli categories could have been influenced by the interactions with the other factors included in the analyses. Also, it is possible that these results were produced by the difference of colors and luminance used in each picture category (Kohn & Clynes, 1969), which were not controlled in this study. Future studies should be conducted using grey images instead of colored ones.

Regarding the emotion regulation effects, valence self-ratings showed that using a foreign language is more effective than the native one to reappraise negative emotions. In particular, the foreign language group showed greater valence self-ratings during the reappraisal of negative pictures compared with non-regulation. However, the native context was less effective down-regulating their negative emotions, revealing no significant differences between reappraisal and non-regulation conditions. These findings are in line with our hypothesis, suggesting that foreign language can be used to attenuate negative emotions when confronting fearful stimuli. Interestingly, these findings were not found for neutral pictures, in which participants rated as more negative the butterflies when reappraising. It may indicate that the suggested detachment produced by the use of a foreign language (García-Palacios et al., 2018) can be useful for reappraising negative stimuli. However, it could hamper the use of reappraisal for pictures that are not unpleasant for the participant. It is worthy to note that, in this study valence and arousal self-ratings for butterflies were more positive (valence:  $M = 7.1$ ,  $SD =$

1.30: arousal:  $M = 2.24$ ,  $SD = 1.49$ ) than neutral, as previous studies had stated (Grimaldos et al., 2021; valence:  $M = 4.92$ ,  $SD = 1.30$ ; arousal:  $M = 3.93$ ,  $SD = 1.51$ ). This could be related to the comparisons carried out during the repository validation and the specific contrast here, only with cockroaches. Therefore, on the basis of the present results, we argue that the use of reappraisal using a foreign language can be advantageous to help reducing the perception of negative emotions, since the cognitive load associated with the use of a less familiar language helps to reduce emotionality. However, it is recommended to be cautious with the generalization of this effect, since it seems that the reduction of emotionality could be a barrier in the case of using reappraisal to increase positive emotions.

Psychophysiological measures, however, did not show the expected results. The present study found that both, electrodermal and pupillary responses, were greater when participants had to reappraise their emotions compared with non-regulating, indicating an increasing of arousal. These results are in line with the pattern observed in previous studies, in which the use of reappraisal was associated with higher arousal in comparison to non-regulation trials (Bernat et al., 2011; Fuentes-Sánchez et al., 2019; Jaén et al., 2021), which has been commonly explained by the cognitive effort made to regulate emotions. Following that line, the physiological results obtained in this study are explained in terms of an increase of arousal produced by the cognitive load associated with the regulation of emotions. Of note, this increment in arousal during reappraisal might only indicate the cognitive effort implied in the process of regulation, but not the effectivity in this regulation.

With regard to the effects of the foreign language on the physiological measures, these were only found for pupil size. Specifically, participants in the foreign language group showed emotion regulation effects for both negative and neutral pictures. However, the native language group showed emotion regulation differences only for negative pictures, but not for neutral ones. Based on the studies that stated pupil dilatation as a marker of both cognitive effort and emotional processing in relation to emotion regulation strategies (Kinner et al., 2017), we state that our results support an effect when using a foreign language. Particularly, these findings support the idea of the additional cognitive load (Alnaes et al., 2014) associated with the use of a non-native language when participants are instructed to regulate their emotions, especially when participants are reappraising positive ones. Nevertheless, it is worth noting that the reappraisal strategies used in this study were focused on down-regulate negative emotions. Future studies should be carried out to determine the foreign language effect with more appropriate strategies for reappraising positive pictures.

These results contrast with the findings obtained by Morawetz et al. (2017), who reported that content labeling was more effective in a second language, while reappraisal showed not being dependent on the language context. However, there are some differences between the study conducted by Morawetz et al. (2017) and this study that can be highlighted. First, the participants were healthy in the Morawetz et al. (2017), whereas in our study a selection of participants with moderate scores on the Cockroaches Phobia Questionnaire were recruited. Moreover, participants in the study of Morawetz et al. (2017) used their inner speech during cognitive reappraisal, while in



our study we instructed participants to say aloud the reappraisal strategy. The variances between the two studies could involve a more effectivity in the use of reappraisal in our study, explaining the discrepancies between them.

Furthermore, Vives et al. (2021) found that downregulation through affect labeling was not effective in the foreign language as compared to the native one. In fact, amygdala activation increased in the foreign language condition, suggesting that the cognitive load associated with the foreign language could interfere with an appropriate downregulation. In this study, however, we also obtained increased electrodermal and pupil responses associated with the cognitive load, but the findings obtained by self-reports indicated that the reappraisal strategy was effective in terms of increasing hedonic valence.

This study expands the current knowledge on the boundaries of the foreign language effect. Previous studies in this line of research showed a weakener effect of the conditioning during the acquisition of fear produced by the foreign language effect (Garcia-Palacios et al., 2018), as the participants put distance with the learning of the association with a possible aversive stimulus. However, this detachment effects were found in the process of extinction when the instructions changed in order to create the new learning of safety (Ortigosa-Beltran et al., in press). In this study we go one step further, introducing reappraisal verbal instructions during the exposure to cockroaches' pictures to participants with subclinical phobia. The findings obtained have important clinical implications, suggesting that foreign language could be used in psychotherapy as a way to reduce emotionality during exposure sessions for specific phobia, in which

psychotherapists want to achieve a decrease of fear when confronting threatening stimuli. In addition, this study opens the door to future studies that aim to study the effects of using a foreign language during exposition for the treatment of other pathologies such as prolonged grief disorder or post-traumatic stress disorder.

This study has some limitations that further studies should consider. In order to provide a more adequate context for the foreign language effect to be present, it would be recommended to provide a design with longer language involvement. Here we eliminated the possible inner speech to ensure that differences could not be explained by changes in the verbal content. However, this measure precludes the spontaneity of the strategy, which could reduce their effectivity. It would be recommendable to enhance spontaneity in order to increase the general language engagement in each language group. In addition, our study was conducted with participants with subclinical phobia. Further studies should explore the implications of this effect on a clinical group in order to test whether the presence of the foreign language effect could depend on the degree of anxiety or fear related to a disorder. Another limitation is the use of dark inter-stimulus screens, instead of the usual gray or white screens in the design of the study. Although it did not interfere with the interpretation of the results, it would be recommended to plan following studies with the usual clearer screens to avoid the possible influence of brightness on the modulation of autonomic nervous system responses (Vasquez-Rosati et al., 2017). Also, because only 12% of participants were male, an important question would be whether the current findings should be viewed as limited to females. We also suggest a deeper exploration of other types of bilingualism,

varying characteristics such the level of proficiency or the context of acquisition. Future work with emotion regulation strategies and other paradigms could examine how different groups of bilinguals may show different patterns of results. These results cannot be generalized to other characteristics.

To conclude, the present study is the first empirical experiment on the influence of the foreign language effect on reappraisal in patients with subclinical specific phobia, showing the possible advantages to use it in the context of exposition to aversive stimuli. Thus, it contributes to the understanding of the role of foreign language in emotion regulation paradigms, an area that lacks of research. Future studies are needed to shape new ways of approaching to different disorders such as specific phobias within the field of psychotherapy.

### **Competing interests**

The authors declare that this study was carried out in the absence of any personal, professional or financial relationship that could be interpreted as a conflict of interest.

### **Availability of materials**

The datasets analyzed for this study can be found in the Open Science Framework (OSF) Repository [<https://osf.io/tjx3d/>].

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#### 4. CHAPTER III. Processing negative autobiographical memories in a foreign language

Ortigosa-Beltrán, O., Jaén, I., & García-Palacios, A., (*submitted*).  
Processing negative autobiographical memories in a foreign

## **Processing negative autobiographical memories in a foreign language**

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### **Abstract**

The use of a foreign language has been introduced in the clinical setting as a form of emotional distance to help deal with negative experiences. However, its evidence of reducing emotionality during the emotional processing is still scarce. This study aims to test whether the description and processing of a traumatic or highly emotional event in a foreign language could modulate the strength of the connection between traumatic symptomatology and emotional reaction. For this purpose, a sample of 128 healthy participants completed a series of questionnaires via an online platform. Firstly, their levels of distress, arousal and valence were assessed in their native language. Secondly, they were assigned to either the native language or the foreign language group and described a negative childhood event in the assigned language, followed by five questions adapted from Foa and Rothbaum (1998) and related to the event. Next, their emotionality was assessed again in their native language. Finally, a questionnaire of traumatic stress symptoms and an avoidance scale were completed. Multivariate regression analyses showed that the relationship between traumatic symptomatology and emotionality was moderated by the language of processing the negative event. Traumatic symptomatology was more strongly

associated with distress and arousal change when the task was performed in the native language. These findings suggest the influence of a foreign language on emotional reactivity when a negative experience is processed, which could be an essential tool in the treatment of disorders related to stress and trauma.

**Keywords:** Foreign language, bilingualism, autobiographical memories, emotions, accessibility

## **Introduction**

Traumatic symptoms are narrowly associated with an increase in negative emotional intensity (Amstadter & Vernon, 2008), which have been directly related to emotional brain regions such as the amygdala and the hippocampus, as well as areas involving negative intense memories (Jacques et al., 2011). Repressing and storing feelings associated with unpleasant or painful memories has been a key topic in psychological tradition. Unravelling and communicating the distressing information we keep to ourselves has long been considered a healthy habit (Frattaroli, 2006) and is associated with improvements in mental health and recovery (Bistrović et al., 2013). As a method to draw and shape painful past events, emotional disclosure is commonly achieved through a linguistic avenue, either written or verbalized (Pennebaker, 1993; Lepore & Smyth, 2002). However, it is a process that may become resistant due to the patient's avoidance related to trauma. Also, patients can find the treatment painful, which difficult the dealing with the negative experience. These resistances have resulted in a growing interest in looking for appropriate psychotherapeutic responses in order to improve the experience of treatment (e.g., Chu, 2008, Bicknell-Hentges & Lynch, 2009).

The scientific community has found different ways of helping patients to verbalize their negative experiences, such as drawing (Baker et al., 2017; Hunter, 2019; Malchiodi, 2012) or writing (Sloan et al., 2015). Some authors also have highlighted the use of a foreign language to narrate a negative experience. Different studies have shown that using the native language (L1) is associated with stronger emotional responses compared to a foreign language (L2; e.g., Harris et al., 2003; Pavlenko, 2012). For example, studies in the area of decision-making reflected this difference between languages, showing that the use of one language or the other had an effect on choices and judgments. Keysar, Hayakawa and An (2012) showed how the use of a foreign language diminished the aversion to possible losses in gambles, thus making the decisions more rational and less influenced by emotions. The resulting outcome of this type of experiment gave rise to a pattern that could be interpreted as a reduction in emotionality as well as an increase of rational thinking in a foreign language as compared to the native one, named the ‘foreign language effect’. The more deliberate and rational effect found when using a foreign language in decision-making constitutes a pattern replicated in other tasks within the same field, such as the ones involving moral dilemmas (Costa et al. 2014), taking risks (Hadjichristidis et al., 2015), or inhibiting reluctance to aversive products (Geipel et al., 2018). Other studies also indexed this effect by physiological measures (Eilola & Havelka, 2011; Iacozza et al., 2017).

Although the origin of this effect is unclear, many authors relate the decreased emotionality in L2 either to the context of the acquisition of this language or to the particular processing associated with a foreign language (Caldwell-Harris, 2014). A foreign language is

usually acquired in an academic environment in contrast with the early and familiar atmosphere in which the native one was learning. In this 'colder' context might grow a larger psychological distance that could evoke less emotionality (Shin & Kim, 2017). Also, Marian and Neisser (2000) specified that the accessibility to the memory was easier when the linguistic context of the recall was the same as the moment of encoding, highlighting the role of language in the process of retrieving autobiographical memories. This is especially relevant framed within the encoding specificity principle in which the properties of a memory can be better retrieved depending on the characteristics surrounding the encoding (Tulving & Thomson, 1973), for instance, the language environment in which it was encoded and retrieved.

A recent study conducted by García-Palacios et al., (2018) showed that conditioning of fear was lighter in a foreign language in comparison to the native one suggesting that the foreign language context can help to reduce emotional reactivity and take distance from the situation. In addition, Ortigosa-Beltrán et al., (in review) explored the effect of a foreign language during the use of cognitive reappraisal and showed that using a foreign language could be advantageous in reducing negative emotionality produced by phobic stimuli by this emotion regulation strategy. In addition, in an experiment on cross-language processing of emotional texts, Dylman and Bjärtå (2018) showed that reading and answering questions regarding negative text extracts in a foreign language was associated with lower distress compared with using the native language. In the same line, Anoshian and Hertel (1994) found a better recall of emotional words in late bilinguals in the native language in comparison to the foreign language, suggesting as a possible interpretation that participants were



paying more attention to the pronunciation in the latter. However, other studies did not show this pattern (Ortigosa-Beltrán et al., in press; Ferré et al., 2010).

The clinical setting has intuitively acknowledged this difference between languages from the patients themselves, referencing, in some occasions, a preference for the foreign language. Marcos and his group (Marcos, 1988; Marcos & Alpert, 1976) explored the dynamic of bilinguals in the psychotherapeutic context, finding that Spanish patients verbalizing their experiences in English, their foreign language, expressed a lower level of emotionality. He pointed out that the individuals could be paying more attention to the correct pronunciation and sentence formation in their foreign language than to what they wanted to express, which could be associated with this emotionality reduction. In this regard, Abutalebi (2008) points out that the grammatical and lexico-semantic processing in a foreign language demands more cognitive resources, as shown by the recruitment of cognitive control brain areas, which may be another possible explanation behind this differential effect. Also, Pitta, Marcos and Alpert (1978) emphasized switching languages as an effective treatment for their hysterical clients, which could express their experiences more easily, avoiding the additional emotional charge using their non-dominant language. This effect of using the distance provided by the 'coldness' of a foreign language was already noted by Freud and his patients (Freud, 1918) and was later referred to as the detachment effect.

More recently, the foreign language effect has received special attention in the area of recalling traumatic memories, which especially painful to retrieve. Autobiographical memories are composed of

sensory information in images, both visual and spatial or auditory, a certain coherence and clarity to a greater or lesser extent, an emotional charge, and language (Greenberg & Rubin, 2003). There is no doubt that language plays a primordial role in the processing of autobiographical memories, making possible the encoding and expression of these memories (Donald, 2012). In this sense, psychotherapy has used language as a tool to rescue negative memories to help deal with those traumatic events that generate discomfort (Larsen et al., 2002). Schrauf, (2000) highlights the language of encoding and retrieval as a marked differential factor and describes a type of pattern in which memories recalled in L2 are remembered more superficially, compared to the high affective content evoked in L1. Studies reported cases of bilingual people who stated that they need to resort to their native language to access the traumatic memories of their childhood more vividly (Aragno & Schlacher, 1996; Javier et al., 1993; Schwanberg, 2010). Iacozza, Costa and Duñabeitia, (2017) also suggest that the use of a foreign language would work as an intermediary or buffer that softens the impact of the emotional distress inherent to strong affective information. In this vein, Jansson and Dylman (2021) also found that using a foreign language modulated the emotionality, vividness and intrusive memories after reactivating emotional autobiographical memories in comparison to a native language. Yet, it is unknown so far to what extent can a different language modulate the relationship between traumatic symptoms related to a negative memory and the emotional response when describing and processing that event.

Therefore, language constitutes a contextual component that can influence the way in which we access and retrieve a memory. The

foreign effect in the recall of traumatic memories needs deeper exploration since it may contribute to a better approach in therapy. Patients are commonly reluctant to retrieve emotional events due to the high levels of anxiety and stress when remembering them, leading to the avoidance of thinking or talking about the memory. In this sense, the foreign language effect could function as a tool which could influence how patients process and perceive their emotions. The current study goes in this direction, examining the influence of language in the relationship between posttraumatic symptomatology and emotional reactivity in terms of distress, arousal and valence. We hypothesize that a positive relationship between posttraumatic symptomatology and emotional reactivity will be found, which will be stronger when the negative memory is processed in L1, compared with L2.

## **Methods**

### **Participants**

A total of 128 participants (60 women; 63 males; 5 other gender; mean age = 28.70; SD = 9.02) took part in the online questionnaire. All participants were non-clinical and agreed with the informed consent. The inclusion criteria were (1) using Spanish as their mother tongue and (2) having a relatively proficient level of English about their self-perception of knowledge, fluency and use of English (see Table 1), which was measured with a brief questionnaire adapted from the LEAP-Q (Marian, Blumenfeld, & Kaushanskaya, 2007). Differences in terms of English proficiency between participants who performed the task in L1 or L2 were not found (mean native group = 7.84; SD = 1.2; mean foreign group = 7.56; SD = 1.2). The most frequent range

of age of foreign language acquisition was between five and ten years old (64%) and also before five years old (17.2%).

**Table 1.** Participant’s basic language skills in the native and in the foreign language groups (means and standard deviations).

	<b>Native (n = 64)</b>	<b>Foreign (n = 64)</b>
General	7.84(1.26)	7.56(1.23)
Speaking	7.20(1.52)	6.90(1.50)
Listening	8.20(1.22)	7.58(1.45)
Writing	8.03(1.44)	7.60(1.40)
Reading	8.73(0.98)	8.40(1.25)

### **Measures**

English skills: An adaptation from the LEAP-Q (Marian, Blumenfeld, & Kaushanskaya, 2007) was used to assess self-perception of knowledge of English skills. The dimensions assessed were writing, speaking, listening and reading. All items were presented on a scale from 1 to 10. This questionnaire was included in the study in order to control the eligibility and study plausible individual linguistic differences between participants who respond in their native language and those who respond in a foreign language.

Post traumatic symptomatology: The Davidson Trauma Scale (DTS; Davidson et al., 1997) is a 17-item questionnaire to self-report the frequency and severity of PTSD symptoms, ranging between “not at all” and “every day” on a 5 point scale. The questions refer to the symptoms of the chosen negative event in the past week. However, participants were asked to answer the questions of this scale regarding their negative childhood experiences recalled in the previous part of the experiment.

Distress: The subjective Units of Distress Scale (SUDS; Wolpe, 1969) was used following Dylman and Bjärtå (2018) as a measure of distress and discomfort, ranging from 0 (no distress) to 10 (high distress). Previous experiments used it as a scale of distress and anxiety (Tanner, 2012). This scale also correlates with the State Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg & Jacobs, (1983).

Valence and Arousal: The Self-Assessment Manikin (SAM; Lang, 1980) was administered to assess ratings of valence of their emotions and the self-report of arousal (people’s reports of affective experience). The scale of valence ranged between 1 (positive valence) and 5 (negative valence), and the scale of arousal ranged also between 1 (high arousal) and 5 (low arousal).

**Table 2.** Bivariate correlations between language, post-traumatic stress disorders, and changes on distress, valence, and arousal

	Mean (SD)	Bivariate Pearson correlations			
		2	3	4	5
<b>1 Language</b>	-	.02	.07	.08	.08
<b>2 PTSD symptoms</b>	10.70 (4.62)		.27*	-.24*	.23*
<b>3 Changes on distress</b>	6.63 (3.45)			.43*	-.67*
<b>4 Changes on valence</b>	13.81 (6.69)				-.43*
<b>5 Changes on arousal</b>	8.55 (4.30)				

*Note:* Because language is a categorical variable, correlations with language were measured with the Eta instead of bivariate correlations, which is an adequate statistic for analyzing non-linear relationships (Shaldehi, 2013); \*p<.001

### Design and procedure

This is a cross-sectional study in which participants completed an online survey displayed with the online platform Qualtrics (Qualtrics, L. L. C., 2010) and disseminated by Prolific ([www.prolific.co](http://www.prolific.co)). The

study was approved by Universitat Jaume I ethical committee (CD/100/2021). Participants entered to the platform according to the criteria related to the native language (Spanish), country of birth and residence (Spain) and a general estimate of the level of English (good/high level). When the eligibility was confirmed, they were informed of the consent form and asked to provide their email, age, and gender. The emails prior experiment and the information on how to complete the tasks were in the native language in order to discard a possible influence of L2. Then, participants completed the English questionnaire, adapted from the LEAP-Q (Marian, Blumenfeld, & Kaushanskaya, 2007), to measure the specific self-perceived level in each of the English dimensions (speaking, listening, writing and reading). Next, they reported the previous levels of distress and emotional affection in order to establish baseline levels of distress, valence and arousal. After that, half of the participants proceeded in their native language (Spanish) and the other half in their foreign language (English). They were requested to think briefly and describe a negative event of the past in the corresponding language, following the memory recall paradigm of free recall used previously (Otoya, 1987; Slofstra et al., 2017). Specifically, they were asked to describe a painful, negative or traumatic event of their childhood following previous literature so that all of them referred to the same period of their lives. Then, the participants had to rate the emotionality of the event on a scale from 0 to 10 and the level of interference at the present time. Next, the five processing questions related to the event were shown in the corresponding language. The processing questions were adapted from the protocol by Foa and Rothbaum (1998) for post-traumatic stress disorder (PTSD). The description of the event

works as part of the processing here, taking into account that the recall of an autobiographical memory could increase the negative affect (Slofstra et al. 2017). In the last phase, all participants returned to the native language and completed the same questionnaires as the first phase to determine the level of distress, valence and arousal. They also completed the DTS at the end of the task in order to not affect the emotional intensity during the processing task. The payment was made through the platform and adjusted to the time spent by each participant (9 euros per hour).

**Table 3.** Multivariate hierarchical regression analyses predicting distress, valence and arousal changes from post-traumatic stress symptoms, language, and their interaction

	Distress					Valence					Arousal				
	$\beta$	t	p	99% CI	R <sup>2</sup>	$\beta$	t	p	99% CI	R <sup>2</sup>	$\beta$	t	p	99% CI	R <sup>2</sup>
PTSD symptoms	.02	4.92	.0002	.011, .033	.07	.01	2.57	.012	.002, .018	.13	-.01	-3.30	.001	-.020, -.005	.10
Language	-.14	-0.68	.501	-.565, .278		-.14	-.95	.342	-.434, .162		.13	.95	.346	-.148, .419	
PTSD symptoms x Language	-.02	-2.45	.016	-.038, -.004		-.005	-.83	.409	-.017, .007		.01	2.02	.046	.0002, .023	



### **Data analysis**

To check the effectivity of the processing task increasing emotionality, three t-student tests were performed with pre and post-scores of all the dependent variables (distress, valence and arousal). Once changes in emotionality were checked, differences between these pre and post-processing scores were calculated to obtain different measures of change in emotionality. Differences were calculated by subtracting the value pre-processing from the post-processing value. Thus, higher change values on SUDS and valence mean more emotional intensity in terms of distress and displeasure, while lower change values on arousal indicate more emotional intensity. Next, bivariate correlations were analyzed in order to study the association between the study variables (post-traumatic stress symptomatology, distress change, arousal change, valence change and Language). To test the moderating effect of Language in the relationship between post-traumatic stress and emotionality, multiple linear regressions were used via the macro PROCESS (Hayes, 2017). Specifically, 3 regressions were performed, one with each dependent variable (distress, arousal and valence), post-traumatic stress symptomatology as the independent variable, and language as the moderator. Conditional effects of the independent variables on the dependent variables were obtained, as well as a graphical representation to interpret the findings. An alpha level of 0.01 was set for all analyses to reduce Type I errors.

**Table 4.** Conditional effects language in the relationship between post-traumatic stress symptoms and distress and arousal

Catastrophizing component- Dependent variable combination	Language	$\beta$	$t$	$p$	99% CI
PTSD symptoms-distress					
	Native	.02	3.922	.0002	.011, 0.034
	Foreign	.001	0.178	.859	-.012, 0.014
PTSD symptoms-arousal					
	Native	-.01	-3.299	.001	-0.020, -.005
	Foreign	.001	-.197	.844	-0.010, .008

## Results

Emotional reactivity during the processing task:

T-test showed that the processing task was effective inducing emotional reactivity, showing higher arousal ( $t=4.80$ ;  $p<.0001$ ), higher distress ( $t=4.89$ ;  $p<.0001$ ) and more displeasure ( $t=8.15$ ,  $p<.0001$ ) during the post-processing compared with the pre-processing phase.

Bivariate correlations between study variables:

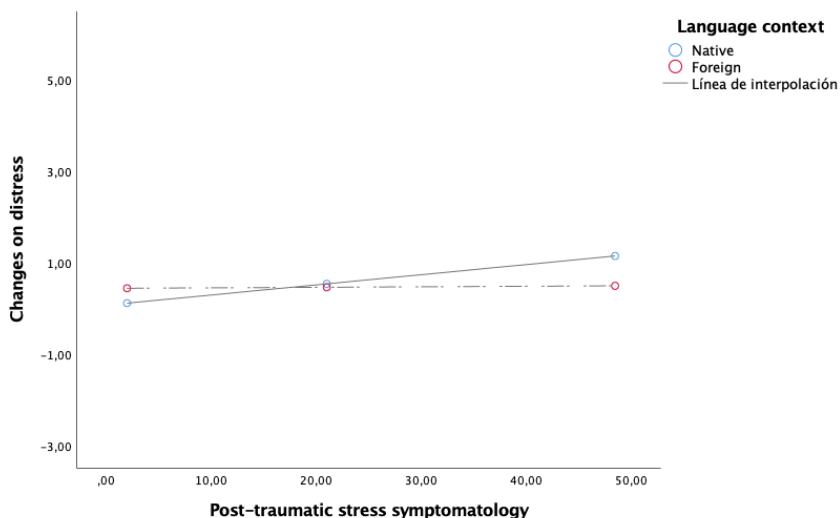
Pearson bivariate correlations showed that post-traumatic stress symptoms were positively associated with changes in both distress and valence (distress:  $r=.27$ ,  $p=.009$ ; arousal:  $r=.24$ ,  $p=.009$ ), while was negatively associated with change on arousal ( $r=.23$ ,  $p=.012$ ). Language was not associated with any of the other study variables (Table 2).

Moderation of language:

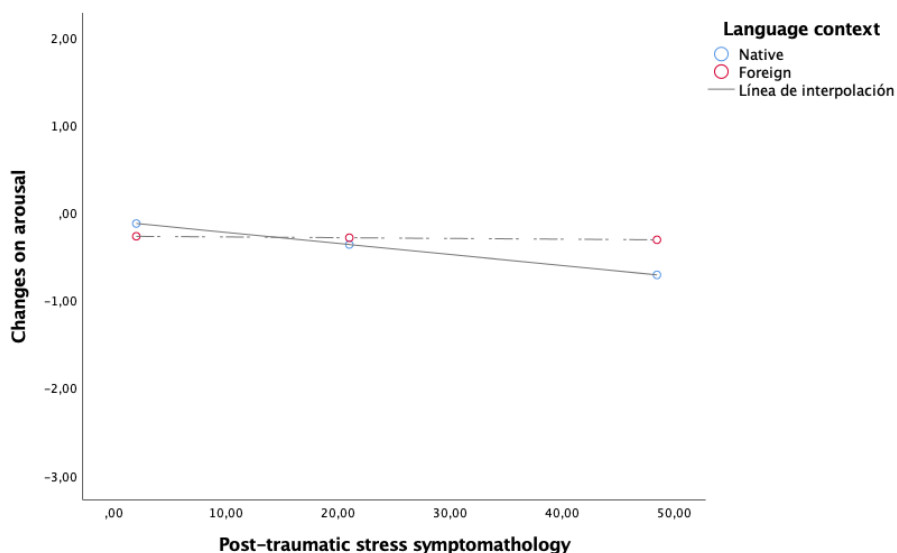
Results from the multivariate regression analysis are shown in the Table 3. The main effect of post-traumatic stress symptoms was significant for distress ( $\beta=0.02$ ,  $t=-3.92$   $p=.0002$ , 99% CI = [0.01, 0.03]), arousal ( $\beta=-0.01$ ,  $t=-3.29$ ,  $p=.0013$ , 99% CI = [0.63, 0.01]) and valence ( $\beta=-0.01$ ,  $t=2.57$ ,  $p=.0115$ , 99% CI = [0.002, 0.018]).

Language main effect was not significant for any model. Regarding the moderation effects, results showed that the interaction post-traumatic stress symptomatology x language was significant in fostering distress ( $\beta=-0.02$ ,  $t=-2.45$ ,  $p=.016$ , 99% CI = [-0.038, -0.040]) and arousal ( $\beta=0.01$ ,  $t=2.02$ ,  $p=.045$ , 99% CI = [0.002, 0.023]), while was not significant for valence. As shown in Table 4, the analyses of conditional effects showed that the strength of the relationship between post-traumatic stress symptomatology and emotional reactivity (distress and arousal) was stronger in participants who do the emotional processing in their native language, while this relationship decreased, being nonsignificant when participants recall and process this memory in a foreign language. A graphical representation of the relationship between post-traumatic stress symptomatology and distress and arousal depending on the processing language is shown in Figure 1 and Figure 2, respectively.

**Figure 1.** Score changes between these pre and post on distress.



**Figure 2.** Score changes between these pre and post on arousal.



## Discussion

The present study is the first to explore whether the language of retrieval modulates the connection between trauma symptoms and the level of emotionality, in particular, distress, valence and arousal, when processing a negative autobiographical event.

As proposed in the initial hypothesis, the results showed that the relationship between the strength of traumatic symptoms and self-reported emotionality, specifically distress and arousal, is moderated by the language used. In particular, this strength is greater when the native language is used compared with using a foreign language. These results are consistent with previous studies that support that the use of a native language produces a stronger emotional response than using a foreign language (Pavlenko, 2012; Iacozza, et al., 2017). These results are explained in terms of attentional resources, which could be divided between using a language that is not mastered and the remembered

event, resulting in less focus on the event itself and consequently working as a psychological or emotional barrier when managing the emotionality that the processing provokes. Thus, in line with Anoshian and Hertel (1994), we highlight the importance of attention in the modulation of the emotional processing of negative events.

These results have important clinical implications for bilingual patients. As previously mentioned, some patients are reluctant to address their negative memories due to the high levels of anxiety and stress when remembering them. On the base of it, it seems feasible here to assume support for the case studies that posited a native language as a facilitator to access past negative events, in contrast to the foreign language (Marian & Neisser, 2000). This access to a memory in a foreign language would undermine the connection between traumatic symptoms and the resulting emotional reaction. Hence, language may be an interesting tool when psychotherapists need to decrease emotionality to do a first approximation to the negative experience.

However, the use of a foreign language could also have some inconveniences in psychotherapy. In view of our findings, it is important that psychotherapists take into account the role of language as a moderator in the relationship between trauma symptomatology and emotional reactivity when working with bilingual or multilingual patients. The use of a foreign language could entail a higher detachment during the processing of a negative event, which could difficult some psychotherapeutic processes such as debriefing. In fact, literature commonly signaled more structured past memories in L1

with richer descriptions (Javier & Marcos, 1989), as well as more memories when cued with words in the native language (Otoya, 1987).

This study has some strengths since it opens the door to a different approach to work with negative autobiographical memories, in which language plays a primary role during the psychotherapeutic process. These findings support the idea by Dewaele and Costa, (2013) of the need to pay more attention to language as an influent factor within the multilingual clinical context. Patients can use bilingualism or multilingualism as a tool to adjust their needs of communication in therapy, as discussed by Dewaele et al., (2020). Even though we have not explained the phenomenon of the foreign language effect, we can bring some perspective to how it works in relation to negative memories and their processing, and ultimately the modulatory role this effect has on emotional response. Still, different paradigms and tasks remain to be explored, especially in relation to negative charged events.

There are some considerations to have into account in this study. One may be the recruitment of a larger sample. As this experiment explores healthy population, the scores are concentrated in low scores in traumatic symptomatology, and the differences are clearer when the DTS scores are higher, so it is recommended to conduct a study with a clinical population either with trauma or with people with an adaptive disorder who have gone through a stressful event. In relation to language, it would be appropriate to specify whether language differences are due to the language itself or to language switching, as in this particular task participants in the foreign language group had to switch from their native language to their foreign for a few items. Recent research has already pointed out the

fact that switching from the native language to the foreign might lead to a facilitation in the processing of negative responses (Zang et al., 2022). In addition, although participants were asked to recall memories from childhood, the majority of the memories were experienced in adulthood; this could imply different outcomes depending on the distance between the memory and the period in which it was experienced. Recent memories, for example, are typically perceived as more vivid and emotionally intense compared to remote memories (Sutin & Robins, 2007).

All in all, we cannot confirm with these results that a different language directly evokes a different emotional intensity. However, these findings have shown that retrieving a negative past event in a foreign language modulates differently the emotional reaction associated with traumatic symptomatology. With this, we tentatively suggest that a foreign language can modulate the emotional expression of certain aspects of PTSD symptoms.

In conclusion, our results are consistent with prior results of bilingual memory, as well as with those exploring emotional material in a foreign language. These findings shed light on the modulatory function that language has with respect to the retrieval of emotional events of the past and raise new questions on the field of recalling negative memories.

#### **Conflict of interest statement**

The authors declare that this study was carried out in the absence of any personal, professional or financial relationship that could be interpreted as a conflict of interest.

#### **Author contributions**

AG-P, AC and IO-B developed the concept of the study and provided ideas for the study design alongside with IJ. IO-B prepared the questionnaires in the online platform. IO implemented the data collection and the testing of the participants. IJ executed the data analysis and interpretation of the results alongside with IO-B. IO-B elaborated the manuscript with IJ under the supervision of AG-P.

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### **Availability of materials**

The datasets analyzed for this study can be found in the Open Science Framework (OSF) Repository [<https://osf.io/n4wvk/>].

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## 5. GENERAL DISCUSSION

The results from the present research are partially consistent with previous research, but also question certain aspects in which the foreign language effect is or is not present. The overarching goal was to investigate whether the use of a foreign language would have an effect in psychotherapeutic paradigms related to the emotion regulation. We would have expected specifically that its use would reinforce the effect of these techniques, making them more effective in reducing the emotionality or arousal response. However, we found diverse results, depending on the techniques, measures, and procedures.

Study 1, differently from our expected results, presents a similar response in both languages, altogether with a clear effect of the instructions in both languages, despite the overall higher arousal shown in the foreign language group. Study 2, on the other hand, presents mixed results. On the one hand, in the physiological measures, we see a similar response in both languages in electrodermal activity, in which we also see a reappraisal effect, while in pupil, despite not finding a general difference between languages either, we see a particularly attenuating response in the foreign language in both negative and neutral stimuli, whereas in the native language it is only seen in the negative ones. On the other hand, the self-reports of arousal in this study 2 show a greater general arousal in the foreign language group, while the valence ratings, although they do not show this general difference between groups, do show specifically in the foreign language group a more positive evaluation of negative images, something that is not seen in the native language. In general,



moreover, an effect of the reappraisal strategy is observed. Study 3 highlights the modulating effect of a foreign language on the connection between trauma and emotionality, specifically revealing that the strong relationship between traumatic symptomatology and distress and reported arousal can vary as a function of the language chosen to describe and process the negative event. Thus, a foreign language would have a more attenuating effect on this relationship.

In general, we have seen a correct functioning of the verbal instructions in the extinction process despite the language used, with no differences between them, also a reappraisal effect in both languages, with greater or lesser effect on certain measures depending on the language, and we have also found a modulating effect of language on the relationship between traumatic symptoms and emotionality, with the foreign language being a palliator of this relationship.

Let's put ourselves in the picture.

I am moving to a different country soon. An English speaking country. In that situation, Spanish will be my native language and English my second language, with a relatively good level, but far from being proficient. Like me, thousands of other people will be in my situation. Now then. Let's suppose that for some reason I decide to seek psychological help in that country. I, like many other people in that position, will have the natural doubt: does it make any sense to go to therapy in the local language? Or is it better to seek a psychologist in my language? Where do I go if I am not even proficient in my foreign language?

Although these studies do not give you the final answer to these questions, they can shed some light on the way. Now we will see in what way each one.

First, study 1 shows us that the emotion of fear in particular, can be extinguished according to arousal measures in both native and foreign languages. For my near-future situation, this would mean calming my nerves in the sense that, well, even though I may not have a perfect level in English, exposure therapy to a possible fear-provoking object or situation would still work. That is, I would not have to worry about my possible failures in my non-native language, because even so, everything indicates that this method of exposure would be effective.

In the case that I had to face some kind of phobia and the therapist decided to approach the fearful object with phrases that help me to reinterpret the meaning of that object, we could have as a reference the results of study 2. If we decided to use emotional regulation strategies to treat it, specifically cognitive reappraisal, we would see that the activation associated with the use of an emotion regulation strategy would occur in both languages at the physiological level, reducing, as seen in the pupil results, the activation in negative stimuli when using this strategy. Although, based on the pupil results, we could carefully assume a softening effect of the foreign language when confronted with neutral stimuli, albeit with positive connotations. But with valence self-reports in mind, we might even rate less negatively the phobic stimuli we face when using the strategy of reappraisal in a foreign language, as with neutral stimuli (the latter also occurs in the native language). However, based on self-reports of arousal, we could assume a greater subjective sense of arousal when

performing the reappraisal task in a foreign language, although there are no differences between languages when performing the task.

All in all, this means that at the objective level, the use of the cognitive reappraisal strategy when confronting phobic stimuli would give effective results in both languages, with the possibility of a softening of activation to neutral stimuli when doing it in a foreign language (considering what we have seen in pupil). On a subjective level, our perception of the phobic stimulus would be less negative (or more positive, depending on how you look at it) when performing the reassessment in a foreign language. At the same time, according to the arousal reports, there would be an internal sensation of greater activation when performing it in our non-native language. After all, the fact that I am focusing my attention on correctly composing the sentences in the foreign language and pronouncing them properly, could make me subjectively perceive myself as more distant from the phobic object.

This study was conducted in a subclinical population and may give us some hints of how a foreign language would behave in a specific phobic population. However, exploring this in phobia at the clinical level would be something to be observed in a future study.

For whatever reason, I might also find myself in the situation of having to deal with a negative experience from my past and describe it. If we decided to do it through writing, it would be somewhat different to do it in the native or the foreign language. Although, again, the process of writing and expressing (disclosure) in a non-dominant language is more cognitively complex, this seems to have effects at the level of perceived distress and arousal. Thus, although in the process I might feel uncomfortable and struggling to

compose proper sentences, it would result in less arousal and distress (probably part of my distress would have remained in the process of trying to write something coherent) than doing so in my native language. Processing a negative memory would feel with less discomfort in a foreign language.

So, if these results were to guide me in the decision to go to psychotherapy in the local language (foreign) or in my mother tongue (native), I might think that, in the end, even if I am not fluent in the local language, I could get equally effective results, at least in these techniques. If, in addition, what I have to deal with is related to a past event that I want to confront, it might even help to emotionally "distance" myself from that experience.

Although these studies explore very specific paradigms with a specific profile of bilinguals, they serve as a cue or guide to further explore these paths.

## **5.1 Where do these results come from?**

The mechanisms behind the foreign language effect are not yet clarified in the literature. And that was definitely not the purpose of this project, although it was to explore how this effect could influence psychotherapy, or certain aspects of it. It may be that along the way or in the process we have been able to shed some light on the mechanisms that do or do not support this effect, or in which contexts it appears more, in which circumstances less. As this is an area of limited information, any study can add something to our knowledge. We hope that here we can discuss at least some ideas in this regard.

The results in these studies are, in line with the overall literature in this area, hybrid. Obviously, it depends on the variety of characteristics of each study and each paradigm used.

One of the first things that stands out is that, despite the strong effect that apparently appears in the literature in this field, it does not seem so easy to find when it comes down to it. We have seen that on extinction and physiological measures and some of the self-reports on reappraisal there are no differences between languages. Many other previous experiments struggled to find differences in the emotional response between languages. Ferré et al., (2010) already exposed that emotional words, both negative and positive, were recalled similarly and with the same level of emotionality in both languages. They pointed out that the disparity of results in this same field of emotional words in memory, suggesting the possibility that this is due to the type of material used, which is different in each study. Conrad et al. (2011) found a similar pattern in the event related potential waves when opposing equivalent emotional words in the native vs. the foreign language. Eilola and Havelka (2011) found that, despite a more prominent response in the physiological measure of arousal in the native group of participants when presenting negative and taboo words, this difference between languages was not reflected on a behavioural level.

And this could go on, but, in contrast, we have studies that do support this effect in different ways, as I referred to in the introduction.

The results of this thesis as well as those of the literature in general are mixed. Therefore, it is difficult to interpret them and put

them into the same framework. Perhaps they have to be interpreted in a mixed way as well.

For the moments when we have found a greater effect on a native language, we find that the "theory of acquisition contexts" fits well to interpret the mechanism driving these results. This theory states that every language is context-bound, and when the language changes, that binding changes too. As argued by Caldwell-Harris (2015), it highlights the stronger binding of native language due to the more natural and emotionally rich context in which it was acquired compared to a more academic context in the case of a non-native language. This idea is also consistent with the theory of language-specific autobiographic recall of memory (Marian & Kaushanskaya, 2007). This approach postulates that knowledge or experience gained in a specific language will be more easily accessible in that same language when recalled. This is especially relevant for study 3, where the recall of autobiographical events plays a major role. We could stipulate that the fact that the modulating effect of a foreign language is more attenuating than the native language in the relationship between trauma and emotionality may be due to this close connection between memory and linguistic context of encoding. Thus, according to Harris et al. (2006) there would be an emotional processing of the task in both languages, but the emotional response would not be expressed with the same strength in the foreign language due to that weaker emotional background in the context of acquisition.

Another theory to which many authors refer to explain the results of studies involving a foreign language is the automaticity theory. According to this theory, the native language would be more automatic than the foreign language, leading to a slower processing of

the emotional information and resulting in a weaker emotional response. Opitz and Degner (2012) interpreted the differences between the native and the foreign language as a delayed lexical access in a foreign language, making it a less automatic language. Again, we would only see this difference in study 3, in which language produces a moderating effect when using the foreign language, resulting in an increase in emotionality after recalling the negative event that is less pronounced or, in other words, more dampened than in the native language.

On the other hand, the results of the extinction and exposure to fearful stimuli studies could not be explained by these same theories. We can refer to the patterns of results obtained in previous studies in the literature, close to the type of experiments in studies 1 and 2, such as that of Morawetz et al., (2017). Their study, especially focused on self-ratings, assess various emotional regulation strategies in both native and foreign language against negative pictures. They found that particularly content labeling resulted in less emotionality in a foreign language in comparison to the native one, while the rest of strategies, including reappraisal, remained quite similar in both languages. Very recently, Vives, Costumero, Avila and Costa (2021) investigated the use of affect labeling in a functional magnetic resonance imaging (fMRI) task. They found that this strategy in a foreign language failed to down-regulate emotions, and, in addition, the activation of the amygdala, far from being lower, was increased in this language. They claimed that correct emotion regulation was impeded by the use of the foreign language. However, back in the two first studies presented in this thesis, although we do not see a general

difference between languages, in study 2 we do see some differences at a more specific level, particularly in pupil and self-ratings of valence.

Another disparity arises from this. Sometimes there seems to be a mismatch between subjective perception and that response reflected in the physiological measures. Other authors have revealed discrepancies between the physiological response and the ratings (e.g., Eilola & Havelka, 2011; Iacozza et al., 2017), showing differences in the arousal response but not in the self-reports. In our case, however, we have seen some differences circumscribed to the behavioral ratings, which, in the case of study 2 at least, did not extend in the same way to the response of the sympathetic nervous system. It seems that the physiological measures captured cognitive and emotional components when confronting the phobic stimuli, by responding differently in the reappraisal strategy compared to non-regulation (cognitive component), and by showing a greater response also to negative stimuli compared to neutral stimuli (emotional component). And this pattern was not exactly equally reflected in the self-reports, especially in the arousal reports. This type of discrepancy is in line with previous studies investigating these physiological measures with the reappraisal strategy (Kinner et al., 2017). Even so, this difference was not appreciated overall between languages, possibly because the cognitive load of the reappraisal sentence did not interfere sufficiently with emotional processing, as suggested by some studies (Chen & Epps, 2013). The difference, perhaps, could then be due to the type of linguistic material used, or the type of stimuli, fear-relevant in our case, and not directly linguistic. Perhaps the fact that they had to keep in mind throughout the task the specific phrase "it cannot do anything to me" in order to reappraise the stimuli, taxed the attentional resources



and diverted attention from the stimuli (Wessing et al., 2013). This would be especially relevant in a foreign language, as it already uses cognitive resources, and accumulated together with the resources already allocated to reappraise, could have resulted in a reduced focus on the negativity of the stimulus, as reflected in the ratings of valence. This would support the idea that a foreign language can function as a distraction. Cases in which a regulatory strategy allows redirecting attention from the emotional object to the strategy itself have been related to a distraction mechanism. Since the use of a foreign language requires larger cognitive control, it might lead to more distraction from the actual emotional stimulus, as Morawetz et al., 2017 hypothesized. This could imply a different outcome at the level of ratings, where the participant is aware of what they report and their attentional resources have been doubly taxed. And it could also be at the basis of interpretation of study 3, relying on participants devoting part of their cognitive resources to describing and expressing through writing the negative event.

With only a partial presence of a different effect between languages, we can hardly drop or label the overall results within one of the theories referred to in the introduction concerning the mechanisms behind this effect. We cannot know, nor were we originally looking for it anyway, whether these results may be due more to an additional cognitive load or to a decrease in emotionality. It is true that in the discussion of the studies a general increase in arousal in the foreign language groups has been associated with an extra cognitive load associated with heavier processing, as referred to in previous studies (Duñabeitia & Costa, 2015). But the reason behind the foreign language effect is neither explored nor clear in these

studies. We know that these studies involve great emotional charge relevant to the participant, especially study 2 (cockroaches) and study 3 (negative autobiographical event). As already mentioned, this is an important factor for the foreign language effect to appear (Vives et al., 2018). It remains to be seen whether or not the same results would be obtained in similar, emotionally neutral studies. However, since these two mechanisms are non-mutually exclusive, whether the cause of the partial differences found in these studies is a decrease in emotional reaction or an increase of cognitive processing is not actually pertinent or meaningful for this thesis.

## **5.2 Shaping the contexts in which a foreign language effect is present**

It seems that not all conditions are ideal for this effect to be present, and it seems that the different fields in which it has been studied agree on some of these factors that have to concur for it to emerge.

Something that Atlas and Phelps, (2018) mention that is relevant to this thesis is the type of instructions. They indicate that fear-relevant stimuli are less reactive to instructions involving safety. While in more neutral stimuli, specifically in extinction, instructions diminish the fear response immediately, in feared stimuli this response is not so quick and is more complicated to abolish. So here we can cautiously assume that a foreign, and in accordance a less dominant and less automatic language, may be less responsive to positive instructions, that is, to instructions related to safety. In our experiment about extinction, one might think of the foreign language as a "discomfort" or "complication", in comparison to the native language

when completing a task. So it would not be unreasonable to think that when extinction instructions, which detach you from a threat, are in a "uncomfortable" language, they may work not better than in the native language, but just as well, thus disappearing the foreign language effect. We might suggest that the foreign language effect is not present when the instructions involve a positive message. This is also supported by the results in study 2, when participants have to use the reappraisal sentence to confront the fearful stimuli. In this case and in the same way, the phrase indicates a positive or safety message, aimed at eliminating an upsetting activation when confronted with the threatening stimulus. And in this case, likewise, the foreign language effect is not generally present at the objective level, having quite similar results in arousal in both languages. However, it is when involving in the equation the ratings of negative valence specifically, in which an increase of valence with a positive tendency can be seen. In this vein, also the study 3 which directly involves narration of a negative experience, shows in major traumatic symptoms, a greater emotional reaction when the modulating language is the native language, and a more softened reaction when the modulating language is the foreign language.

Sheikh and Titone (2015) argued on a related note that the psychological or emotional distance associated with a foreign language might be linked especially to negative words, reasoning that a language learned later in life, with adult social interactions having a positive bias, would not leave much opportunity for negative words to be emotionally anchored. This view has been supported by neural mechanisms differences between positive and negative stimuli that have representations in different parts of the brain (Craig, 2008), and

also in relation to differences between native and foreign languages with respect to positive and negative stimuli (Eilola & Havelka, 2011). In line with this, Ayciçeđi and Harris, (2004) found in a recall task that when recalling both positive and negative emotional words, the emotional effect was greater in the foreign language for negative words, resulting in an emotion-memory advantage for negative words in a foreign language. Again, a more subdued effect of emotional response in the foreign language has been more related to negative words due to, as Circi (2021) poses, a foreign language is usually more used in positive topics or conversations than a native language, which encompasses more all valences in the exchanges (see Foroni, 2015; Jończyk et al., 2016). This would support the fact that the first two studies, which involve linguistic material in a positive tone, show no main differences between languages, while study 3, in which the description of the autobiographical event does involve the use of more emotionally negative phrases and words, shows a modulating influence of language. Other authors have highlighted as a cause a different impact of the foreign language on negative material as a consequence of a different processing of linguistic negation (Ullman, 2001). In this line, it has been suggested that negative words in a foreign language are processed in greater depth compared to the first language, something associated with the fact that in a non-native language the more aversive tone linked to negative words is better tolerated (Martins et al., 2003). In any case, the difference in the impact of a foreign language could go in accordance with the valence of the material that is verbalized or manifested. This could be a point to explore further in the future and could help guide how to use a non-native language in the therapeutic context.

Furthermore, it is also relevant the aspect of how personally bound the instructions, or the aversive object, are to us. This would relate to the choices at a personal level mentioned in the introduction in the area of decision making. Some authors stated that when the dilemmas involved aspects connected on a personal level with the participant, the foreign language effect appeared (Brouwer, 2021). Brouwer argues that it makes sense that emotionality is greater when the issue to confront involves the self. This can also be observed in this project, in which study we can witness more of a foreign language influence, and in which we cannot. Thus, study 3, negative autobiographical memories, is the most personal and brings out the most intimate aspects of the emotional side of the individual. Therefore, these results would also support the presence of foreign language effect in contexts that are more personal or directly related to the participant.

In conclusion, if we refer to this project and align it with previous research, we could state that these results support to some extent that the foreign language effect is especially present when the material to be expressed has a negative tone, far from instructions about safety or with a more positive connotation. Likewise, it supports the fact that it is present when the linguistic material involved is on a more personal level. It would therefore contribute to defining the boundaries of the foreign language effect.

### **5.3 The type of bilinguals to make the effect work**

We knew so far that age and context of acquisition and the level of proficiency played a prominent role in defining the type of bilinguals that could make this effect work. This rationality or 'coldness' that emerges from this profile of bilinguals or multilinguals appeals to the psychological distance, or symbolic separation with respect of the aversive object. This psychological or emotional distance is something very particular to the foreign language effect and, specifically, to this type of bilinguals.

The profile of the participants in these studies has followed the pattern of the majority of studies carried out on the foreign language effect in areas such as decision making. In particular, they have followed the pattern of the participants chosen in the study by García-Palacios et al. (2018), in which the differences in the acquisition of fear between languages were assumed to be a consequence of the differential characteristics of their foreign language with their native one. It has been shown that when the level of proficiency of the foreign language is similar to that of the native one, the differential effect disappears (Čavar & Tytus, 2018). Regarding the age of acquisition, in all these studies the foreign language started to be studied later in life in comparison with the native language. This seems relevant to mark the effect since the native develops early, at the same time as emotion regulation systems, according to Bloom and Beckwith, (1989), while the foreign language develops in a later stage. But the evidence suggests that both language proficiency and age of acquisition are, at the same time, necessary to witness a different effect between languages, as Harris et al., (2006) proposed. Harris and his group studied bilinguals with Spanish as their first language, learned at home during childhood, and English as their second language, learned

later in school. However, in this case the more proficient language was the second language, despite having learned it later and in an academic context. The result of this unusual scenario was a similar emotional arousal response in both languages. In this study, if only proficiency level had been taken into account, the second language would have shown greater arousal, whereas if only age of acquisition had been taken into account, the native language would have shown greater emotional responses. In conclusion, both seem important.

However, other factors are relevant to this equation. Some argue that learning via immersion and using the foreign language with frequency could increase the emotionality of the foreign language and erase the presence of the effect (Dewaele, 2010; Degner et al., 2012). Nevertheless, we chose to collect only participants who learned the foreign language in an academic context and were currently living in Spain (native country), so immersion and frequency were not a determining point in this project. Another factor that may influence the greater or lesser emotionality of one language or another is the similarity between them. Dylman and Champoux-Larsson, (2020) interpreted their results on the effect of foreign language on different decision-making tasks, as boundaries regarding language similarity and cultural factors. However, in the present project the native language (Spanish) and the foreign language (English) do not share linguistic roots and the cultural distance between them is large, and therefore it would not be a relevant factor in these studies.

In the end, all these factors are reciprocally related, early age of acquisition usually leads to high proficiency; high proficiency usually leads to frequent use, frequent use improves proficiency, immersive learning leads to higher frequency of use and better proficiency.

Although results were similar in both languages on fear extinction and partially in reappraisal during exposure to cockroaches, reports of emotionality on the retrieval of negative memories seem to suggest a language influence, and we cannot assume that this difference (and those that do not) would be the same with a different type of bilinguals or multilinguals.

All things considered, examples such as the above give us reason to think that it is not the second, third or fourth language per se that provides an emotional advantage in a given context, but the characteristics of the language in a particular bilingual or multilingual individual.

## **5.4 The place of the foreign language effect in psychotherapy**

Considering that we take the foreign language effect as a basis from which to start in one direction or another for its use in psychotherapy, we must take into account its limitations. Our knowledge of the foreign language effect is scarce at the moment, sometimes controversial or even contradictory. Trying to go a step further and see the effects of a blurred effect in a wide and solid area such as psychology is a challenge.

Specifying the characteristics that make the foreign language effect present, or in other words, how to use a foreign language in a clinical session, can have important implications for how a treatment, or a particular technique, or a particular disorder, is approached in the clinical setting.



As we have mentioned, whether the impact of language on the treatment is greater or lesser depending on the valence of the material to be verbalized or used, or depending on the type of bilingualism or multilingualism the patient has, and so on. These are characteristics that will determine the approaches.

But on the one hand, there are different and common mechanisms in the strategies explored in this thesis. Different forms of regulating intense emotions. One thing that somehow unites these three studies, especially the first two, is an emotion: fear. This emotion is closely linked to the amygdala (Davis, 1992). On the other hand, the strategies used here have been diverse, and they diverge and share some mechanisms as well. Extinction of fear and emotion regulation strategies, as two distinct approaches to regulate our emotions, commonly pass through the amygdala when approaching a fear, and both seem to diminish its functioning through frontal regions, such as the ventromedial prefrontal cortex (vmPFC) (Delgado et al., 2008). In addition, there appears to be a major overlap in areas related to attentional and cognitive tasks, such as the dorsal anterior cingulate cortex (dACC) and the bilateral anterior insular cortex (AIC) (see Picó-Pérez et al., 2019 for a review). These parts in conjunction with emotional parts are considered as a control loop of self-regulation (Langner et al. 2018). Also, part of the "salient network", in charge of the response to relevant stimuli with emotional charge. Although, certainly, there are then divergences in that extinction, for its part, is also inclined to recruit areas related to emotional and sensory information, while cognitive reappraisal is more inclined towards fronto-parietal regions in charge of managing information relevant to reappraise. Approaching traumatic memories, on the other hand, also

recruits frontal parts that mediate with the amygdala, such as the vmPFC among others (Summerfield et al., 2009), as well as visual imagery areas such as precuneus as participants recall and remember the negative event (Sartori et al., 2013).

Nonetheless, the amygdala is the target of all of them, directly or indirectly. The frontal parts participate in cognitive control. If we support the fact that the foreign language effect is to some extent governed by some cognitive control, we can say that the vmPFC has been involved in mediating the amygdala. To a greater extent, by all accounts, in study 3, perhaps through a distraction or detour in its attentional resources in rescuing and unfolding the painful experience.

Nevertheless, the mechanisms governing healing processes sometimes are less important, as long as these healing processes work. In this case, less importance has been given to what is behind each strategy or paradigm than to the effect that a foreign language may have on them and, consequently, on the individual.

One thing that can be glimpsed in these results is that it is important to pay attention to the subjective impressions of patients, since it seems that self-reports are a discriminating measure depending on the conditions, and can provide information on the state of the individual. In addition, this can guide or indicate the patient's preferences for using one language or another in the therapeutic setting, and how it makes them feel. Caldwell-Harris and Aycicegi-Dinn, (2009) for example, point out the different nuances with which participants experienced lying in their native or foreign language. They noted that some preferred the foreign one so as not to feel the burden of lying so much, while others were more concerned about the additional stress of lying in a language they are not fluent in.

Regarding the use of a foreign language in the laboratory, studies such as Vives et al., (2021) or Morawetz et al., (2017) give us an idea of how complicated it will be to find the usefulness of this effect within certain strategies of emotion regulation. We would have to look at other types of strategies in the future. It is also important to keep in mind that the mechanisms behind the paradigms used in this thesis differ in certain parts, and we could not yet know how a foreign language acts on them. Or on different ones. Likewise, although here we have focused on the emotion of fear, there are other emotions involved in different disorders, and they deserve research on their own.

The important thing is that launching studies like these puts us on the right path towards identifying tools or key aspects that can help develop more suitable treatments and approaches in the clinical setting.

## **5.5 Need for experiments, but in what direction?**

Bilingualism is an inevitable part of human cognition. It is on this bilingualism-emotion interaction that we need to focus and examine which language variables we could vary or analyze in depth to find out how and in what way it modulates emotion. To unravel the specific mechanisms that foreign language affects within each disorder to be treated. Similarly, explore the mechanisms of the strategies to be used as well.

However, it may not be essential to focus on the distinction between a mother tongue and a foreign language per se, but rather on

the characteristics of each. As Gutfreund, (1990) pointed out, the characteristics of the language to be used are more relevant regardless of whether it is the native language or not. He concluded this when he found that in his study both English-Spanish bilinguals and Spanish-English bilinguals showed a preference for Spanish in expressing emotional issues. Thus, age and context of acquisition, frequency of use, proficiency, immersion, are characteristics to be taken into account in exploring emotional reaction and perception when using a language (Dewaele, 2004; Pavlenko, 2012), and should be further explored in forthcoming research to specify different ways of presenting foreign language effect. Especially as the field of psychotherapy is such an unexplored terrain under the magnifying glass of a foreign language.

For the future and in the light of the results presented in this thesis, studies involving negative material directly could be suggested. In the field of psychotherapy, for example, accounts of traumatic experiences in other formats, perhaps verbal or written re-elaborations. Also, for the first phases of exposure in phobias, in which certain negative emotions or aspects of the fearful object cause discomfort, they can be labelled in different languages.

Besides, as pointed out by Vives, (2020), there might be a curious trend following this foreign language effect. It seems that there is a comparably greater predisposition to publish studies with positive results and to leave less positive results in a drawer. Future studies should consider publishing results that do not necessarily show significant results, which, although less attractive, help to delineate the lines and perimeters where the limits of this effect really lie, and to have a better and more precise view of where this effect is moving. In

this way it is easier to follow a trail and generate the necessary factors to use it, if possible, as a tool in certain fields, such as psychotherapy.

Finally, perhaps understanding how to better include a different language in the clinical setting might guide both therapists and patients in negotiating the appropriate language to use in session, according to the disorder, approach, stage of treatment, or the languages available.

### **The end**

Perhaps we need to be very concrete and specific about the conditions under which this effect can emerge and do so in a useful way, in this case, in terms of psychological treatments. Further research into the foreign language effect and exploring its forms and procedures will be of vital importance if our intention is to offer a broadening and widening of the therapeutic space through bilingualism and multilingualism. There are many paths that lead to the improvement of therapeutic practice, this is just one of them.

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