Lexical selection in spoken word production among Arabic-French bilinguals: A language-specific or nonspecific process?

Mémoire

Mariem Boukadi

Maîtrise en linguistique – Didactique des langues
Maître ès arts (M.A.)

Québec, Canada

Résumé

L'objectif principal de ce mémoire est d'étudier la nature du processus de sélection lexicale chez des bilingues tardifs modérément compétents et locuteurs de deux langues lexicalement distantes : l'Arabe tunisien (AT) et le Français. Dans un premier temps, une base de données psycholinguistique en AT a été créée aux fins du contrôle convenable de variables psycholinguistiques dans la sélection des stimuli en AT. Cette première étude avait aussi pour but de mettre à disposition des chercheurs intéressés par le traitement du langage en Arabe une ressource psycholinguistique nécessaire. Dans la deuxième et principale étude, des bilingues AT-Français ont effectué une tâche d'interférence image-mot dans deux contextes expérimentaux différentes : unilingue (Expérience 1) ou bilingue (Expérience 2). Nos résultats suggèrent que le traitement lexical chez les bilingues est dynamique et modulé par un nombre de facteurs incluant, mais non limités à, la compétence langagière et le contexte langagier de l'expérimentation.

Abstract

The main aim of this master's thesis was to investigate the nature of the lexical selection process among late moderately proficient bilinguals whose two languages are lexically distant: Tunisian Arabic (TA) and French. As a first step, a psycholinguistic normative database in TA was created to enable proper control of several psycholinguistic variables in the selection of TA stimuli. This first study also aimed to provide researchers interested in Arabic language processing with a much-needed psycholinguistic resource for a spoken variety of Arabic. In the second and main study, TA-French moderately proficient bilinguals performed a picture-word interference task in two different language settings: monolingual (Experiment 1) and bilingual (Experiment 2). Our findings suggest that bilingual lexical processing is dynamic and modulated by a variety of factors including, but not limited to, language proficiency and experimental language setting.

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ACC	anterior cingulate cortex
DA	dialectal Arabic
FAM	familiarity
FREQ	subjective frequency
ICM	inhibitory control model
IMA	imageability
MSA	modern standard Arabic
NA	name agreement
phWL	word length in phonemes
PWI	picture-word interference
SOA	stimulus onset asynchrony
syllWL	word length in syllables
TA	Tunisian Arabic
WL	word length

To my mother, Sara,
my hero

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Foreword

This master's thesis is presented to the Faculté des Études Supérieures de l'Université Laval for the obtention of the title maître ès arts (M.A.). It was supervised by Mr. Maximiliano A. Wilson, Assistant Professor at Département de réadaptation, and co-supervised by Mrs. Kirsten Hummel, Full Professor at Département de langues, linguistique et traduction, both at Université Laval. It is constituted of two articles (presented in Chapter 2 and 3, respectively) preceded and followed by a general introduction and discussion, respectively.

Chapter 2 presents the manuscript of the first article. It was entirely written by Mariem Boukadi (first author). As first author I also prepared the stimuli, analyzed the data and created the database presented in Appendixes A and B. Cirine Zouaidi (second author) collected the data and transcribed the words listed in both appendixes in Arabic script. She also gave advice on the preparation of the stimuli. Finally, Maximiliano Wilson (third author) supervised all aspects of the research process. He developed the research design and supervised me when writing the DMDX scripts for the tasks used in this study. He revised, corrected and improved different versions of the manuscript and the appendixes. This article was submitted to the journal Behavior Research Methods and is currently under review.

Chapter 3 presents the manuscript of the second article which was entirely written by Mariem Boukadi (first author). As first author I was responsible for selecting the stimuli, creating the DMDX script for both tasks, testing the participants, and processing and analyzing the data. Maximiliano Wilson (second author) supervised all the abovementioned aspects of the research process and gave significant input and assistance in analyzing and interpreting the data and writing and revising the manuscript. He also developed the research design for this study and carried out several statistical analyses on the data. The manuscript has not been submitted for publication yet.

Chapter 1: General introduction

More than half of the world's population is bilingual. In Canada, almost 20% of the population speaks two, or more, languages, a percentage that rises up to 42% in Quebec alone (Lepage & Corbeil, 2013). These figures call us to reconsider the focus on the monolingual as the model of the normal speaker and hearer and tell us bilingualism is far from being the exception. Therefore, it is important to study how the bilingual mind and brain process language, as separate and distinct phenomena from monolingual language processing. Moreover, the study of bilingual cognition can inform us on a broad range of topics including language representation and both normal and impaired language processing phenomena. It can also inform us on the role played by different cognitive functions (for example, executive functions) in language processing.

1.1 Research problem

Research on bilingual word production has consistently shown that during lexical access the target concept spreads activation to lexical representations from both languages (e.g., Colomé & Miozzo, 2010; Colomé, 2001; Hermans, Ormel, van Besselaar, & van Hell, 2011).

The presence of cross-language activation begs the question of how bilinguals are able to select the lexical alternative of the intended language of communication (a process known as lexical selection). Lexical selection typically involves competition, meaning that several lexical items are activated and compete for selection. There is lack of consensus among researchers on whether this competitive process is cross-linguistic. This is what has been known as the "hard problem" (Finkbeiner, Gollan, & Caramazza, 2006) and is the subject of an ongoing debate in the field of bilingual language processing. Two main views dominate this debate: the language-specific versus the language-nonspecific view. According to the first, even though lexical representations from both languages are activated, only the target language lexical items enter into competition (Costa & Caramazza, 1999). The second view conceives lexical access as a wholly cross-linguistic process, from activation to selection (Green, 1998; Hermans, Bongaerts, De Bot, & Schreuder, 1998).

Thus far, only a handful of researchers have gone down the tricky road of bilingual lexical access in word production. Findings from these studies are inconsistent and inconclusive, mainly due to methodological pitfalls (e.g, Costa, Albareda, & Santesteban, 2008; Costa, Colomé, Gomez, & Sebastin-Galls, 2003; Costa, Miozzo, & Caramazza, 1999; Costa & Caramazza, 1999; Hermans et al., 1998; Hoshino & Thierry, 2011). The majority of these studies used the picture-word interference (PWI) paradigm in a picture-naming task where participants have to name a picture in their L2 while ignoring a visual or auditory distractor word in their L1 or L2. This paradigm provides a unique way of untangling, behaviorally, specific sub-processes in lexical access (e.g., lemma selection) indexed by behavioral effects and tracking their locus in the time-course of processing. Using this task, some studies found some evidence for cross-linguistic lexical selection (e.g., Hermans et al., 1998). However, it was not reliable enough to adjudicate between the competing views of the bilingual lexical selection process. Moreover, the majority of studies that found cross-language competition using the PWI paradigm involved Romance and Germanic languages: Dutch-English (Hermans et al., 1998); Spanish-English (Hoshino & Thierry, 2011); and Spanish-Catalan (Costa et al., 2003, 1999). The orthographic and phonological similarity of these languages or their lexical proximity might have played a role in the cross-language interference effects observed. Additionally, all these studies involved highly-proficient bilinguals. Therefore, it is important to further investigate the bilingual lexical selection process with another set of lexically distant languages and with bilinguals with a less advanced L2 proficiency level in order to validate the reliability and generalizability of cross-language competition effects.

1.2 Objectives

The general objective of this master's thesis was to investigate the dynamics of the lexical selection process during word production among Tunisian Arabic (TA)-French bilingual speakers in relation to variables such as language proficiency, lexical distance of the bilingual's languages, and language context (i.e., monolingual vs. bilingual context of communication). The present work is further subdivided in two specific objectives.

In the first study we collected norms in TA for four psycholinguistic variables: name agreement, familiarity, subjective frequency, and imageability. This study aimed to establish a normative database in TA that will serve:

1) In controlling the stimuli selection for the experimental task used to investigate the abovementioned research questions; and
2) Seeing the lack of such resources for Arabic, the usefulness of such a database will extend beyond the scope of this work and will serve in future psycholinguistic studies investigating Arabic language processing.

The second study comprises two experiments using the PWI task: in the first experiment picture-naming and the presented distractors were in French, while in the second experiment, pictures were named in French and distractors were presented in TA. The specific aims of this study are the following:

1) To replicate Hermans et al.'s (1998) experiments (which involved two Germanic languages: Dutch and English) with two lexically distant languages: TA and French.
2) To test the hypotheses of the language-nonspecific lexical selection model by means of the PWI task.
3) To test cross-language competition in two different experimental language settings, namely an entirely monolingual experimental context where the non-target language (TA) is absent (Experiment 1), as in Hoshino and Thierry (2011), and a bilingual context where both languages are present (Experiment 2).

1.3 Defining bilingualism

A bilingual person is defined in the Oxford dictionary as "a person fluent in two languages". Bilingualism has been defined in many different ways over the years and definitions vary from one perspective to another (linguistic, psycholinguistic, sociolinguistic, etc.). In general, the many different definitions of bilingualism may be classified in two main views: fractional and holistic (Grosjean, 1989).

For a long time, many researchers have defined bilingualism from a language proficiency perspective. In this perspective, a bilingual is someone who has achieved

relative proficiency and competence in the four skills of two languages. In this 'fractional' view, the bilingual is simply two monolinguals in one person (Grosjean, 1989). In the field of psycholinguistics, this definition entails that language storage and processes in bilinguals are the same as in monolinguals. As a consequence, many researchers have focused on how each language is stored and processed separately. Additionally, models of bilingual language processing have been largely adapted from monolingual ones with little modification (e.g., De Bot's model of bilingual language production; 1992).

By contrast, in the holistic view bilingualism is defined from a language use perspective according to which a bilingual is someone who uses more than one language in her/his everyday life in different domains and for different purposes (Grosjean, 1982). In this sense, the bilingual's level of competency in either language as a whole and even in each language skill will vary depending on her/his communication needs and the environment in which either language is used (including interlocutors and domains of life such as work, home, school, etc.). In this integrative view, the bilingual is a unique speaker-hearer distinct from the monolingual and should thus be studied as such (Grosjean, 1989). Therefore, in the present work we chose to subscribe to this holistic view of bilingualism.

Different types of bilingualism have been identified, as determined by the age of acquisition of the second language and the relative levels of proficiency in the two languages. With regards to age of acquisition, two main types of bilinguals arise: early bilinguals (simultaneous, where the languages are learned at the same time from childhood, or sequential where one language is learned after the other in childhood), and late bilinguals (the second language is learned after childhood). With respect to proficiency level, bilinguals may be classified as balanced or unbalanced with the former having equal proficiency in both languages while the latter have a dominant language (i.e., the proficiency level of one of their languages is higher than that of the other). Often, the first or native language is the dominant one, however in some cases reversal in dominance and even L1 attrition may take place thus causing the second language to become dominant.

The different views of bilingualism will have an impact on how psycholinguists develop theories and models of bilingual language storage and representation. Below, we present and describe the main models of bilingual spoken word production.

1.4 Bilingual language production

In this section we will present and briefly describe the main model of bilingual word production. We also introduce Grosjean's (2001) influential language mode hypothesis. Taken together, these proposals represent the theoretical framework in the light of which the results of our experiments were interpreted.

1.4.1 De Bot's model of bilingual language production

The model of bilingual language production developed by De Bot (1992) is the main theoretical framework underlying studies and models of different processes involved in bilingual word production (e.g., Green's model of the lexical selection and control mechanism, 1998) and is essentially an adaptation of Levelt's (1989) model of monolingual language production to bilinguals. Levelt's (1989) model involves a conceptualizer, a lexicon, a formulator, a monitor system, and an articulator. The conceptualizer is where the preverbal message is formed, it is separate from the lexicon and activated by the intention to speak. The preverbal message then in turn activates the formulator. Lemmas (i.e., lexical entities containing semantic and syntactic information) are activated and compete for selection. Once a lemma is selected, the formulator encodes its morphological and phonological forms. The phonological form produced by the formulator is sent to the monitor and the articulator. The latter produces the articulatory movements corresponding to the phonological form. Finally, the monitor system provides feedback as it connects the production system to the comprehension system thus allowing the speaker to review the output of the formulator (inner speech). De Bot (1992) made very few modifications to this model. The lexicon is integrated but subdivided into two sub-lexica, each of which has its own formulator. Additionally, there is one conceptualizer and one articulator shared by both languages.

1.4.2 Grosjean's bilingual language modes

Grosjean's language mode hypothesis merges the sociolinguistic and psycholinguistic dimensions of bilingualism and provides a theoretical framework for bilingual language processing in relation to the context of communication. Grosjean (2001, p. 3) defines the language mode as "the state of activation of the bilingual's languages and

language processing mechanisms, at a given point in time." The language mode can be seen as a continuum in which the two extremes are the monolingual mode and the bilingual mode. When in the monolingual mode (i.e., when interacting with monolingual interlocutors), the speaker chooses a language to speak in (language A) and deactivates the other language (language B), but never completely. In the bilingual mode (i.e., when speaking with bilingual interlocutors) both languages are active. The speaker chooses a base language (A) and activates the other (B) to which s/he may switch mid-speech (often mid-sentence). The level of activation of language B determines where on the language continuum mode the bilingual speaker is.

1.5 Bilingual lexical access and selection

In monolinguals, lexical access is based on the principle of spreading activation (Levelt, Roelofs, & Meyer, 1999). When trying to name a picture for example, the first step is to retrieve the appropriate concept (e.g. dog) but during this process other related concepts are activated as well (e.g. fox). These representations, in turn, spread activation to the corresponding lemmas in the mental lexicon. These lemmas are thought to compete for selection and the speaker then must choose the appropriate lexical item. Once a lemma is selected (as soon as its activation level exceeds the sum of the other lemmas' activation levels), its corresponding morphemes and lexemes are retrieved. Selection of the appropriate lemma depends on its level of activation but also on the activation levels of non-target lemmas. High levels of activation of non-target lemmas mean the selection process will be more difficult and will take more time.

If we assume that the principle of spreading activation also applies to bilinguals that would mean that the activated conceptual representations (stored in the common conceptual store) spread activation to corresponding lemmas of both languages regardless of the intended language of speech. Evidence for this comes from several studies (e.g., Colomé, 2001; Colomé & Miozzo, 2010; Hermans et al., 2011). But as mentioned above, a point of contention is whether non-target lemmas enter the competition for selection or not. Models supporting either view (language-specific vs. nonspecific) were developed. Figure 1 presents a simplified representation of both models of bilingual lexical selection.

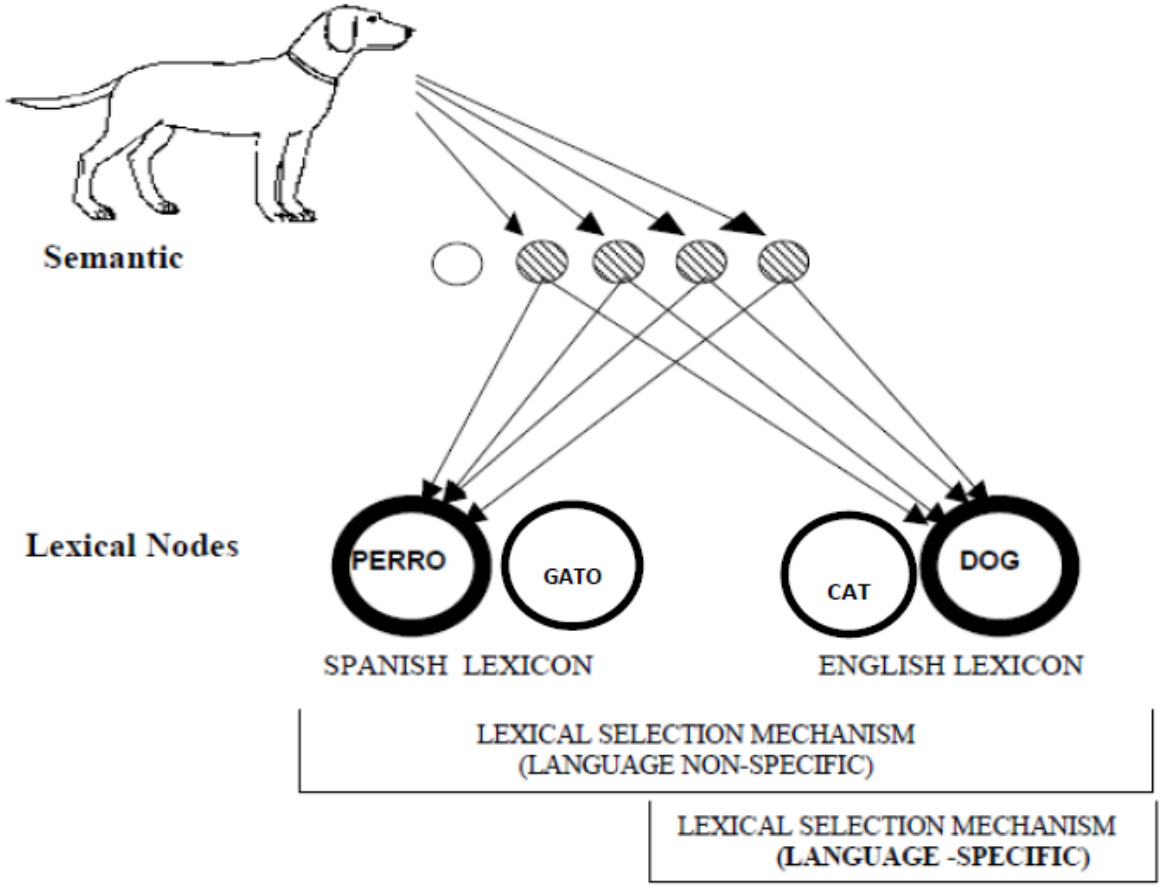

Figure 1. Language-specific vs. nonspecific views of bilingual lexical selection (adapted from Costa, Colomé, & Caramazza, 2000; figure 4, page 413).

1.5.1 Language-specific lexical selection

According to this view, during lexical access in production, lexical representations from the non-target language are activated but do not compete with those of the intended language of production (Costa & Caramazza, 1999). This view fixes the locus of language selection at the conceptual level. Lexical representations have been hypothesized to contain information that specifies their 'language membership' (Costa, Santesteban, & Ivanova, 2006). This feature enables the lexical selection mechanism to direct attention solely to the activation levels of lexical items that are "members" of the intended language of speech or to heighten their activation levels (La Heij, 2005). La Heij's (2005) 'complex access, easy selection proposal' is a language-specific model that offers a specific hypothesis on how language membership may be represented and determined at the conceptual level. In this

model the intended language is a conceptual feature specified in the preverbal message along with other features like register and the concept to be expressed. Thus, lexical competition occurs only within the target language, as in monolinguals. However, in language-specific models, selection mechanisms are constrained within the language system and are underspecified. In an adaptation of Poulisse and Bongaerts's (1994) model of bilingual production, Kroll, Bobb, and Wodniecka (2006) argued that a "language cue" at the conceptual level specifies the language of production.

In most cases language-specific lexical selection is hypothesized for production in L1 (the more dominant language). For example, Kroll et al. (2006) reported evidence for this hypothesis from a code-switching experiment. It demonstrated that L1 picture-naming was faster than L2 picture-naming and that L2 had no influence on picture-naming in L1, whereas L1 influenced production in L2. This was taken as evidence for the idea that in contexts where the language of production is L1 (e.g. in L1 monolingual mode), the lexical selection process is language-specific. In a series of experiments, Costa and colleagues investigated the effect of proficiency level on switching performance in a language switching task (Costa et al., 2006; Costa & Santesteban, 2004). In this task, participants alternate between their languages in response to a cue when naming pictures (for example, naming in language A when the picture's background is red, and naming in language B when the background is blue). The difference in naming latencies between non-switch (trials where participants name pictures in one of their languages) and switch trials (trials where participants alternate between their languages in naming pictures) is known as the language-switching cost. If the switching cost is more important for L1 than for L2 (signifying that it is harder to switch into L1 than into L2), it is said to be asymmetrical. Alternatively, if the switching cost is similar for L1 and L2, then it is said to be symmetrical. Costa and colleagues found that while low-proficient bilinguals show asymmetrical switching costs, highly-proficient bilinguals (i.e., bilinguals who were very proficient in both their L1 and L2) produced symmetrical switching costs even in experiments where the difference between the proficiency levels of the two languages involved in the experiment (i.e., their L2 and an L3 for which their proficiency level was low) was large.

This particular finding contradicts one of the predictions of the most influential model for a language-nonspecific mechanism: the Inhibitory Control Model (ICM; Green, 1998). This model predicts that a large difference in languages' proficiency levels will result in asymmetrical switching costs. Costa and colleagues took this as evidence that a shift from an inhibitory (language-nonspecific) mechanism of selection to a language-specific lexical selection mechanism occurs as a function of increase in proficiency level. However, the language-switching paradigm serves to investigate the control mechanism involved in lexicalization and does not actually inform us on the nature of the lexical selection per se and the cross-language interactions that may or may not take place. In fact, a symmetrical switching cost with unbalanced proficiency levels of the languages involved is not incompatible with the language-nonspecific view and only contests one of the predictions of Green's (1998) model.

1.5.2 Language-nonspecific lexical selection

Advocates of the language-nonspecific process (e.g., Christoffels, Firk, & Schiller, 2007; Green, 1998; Hermans et al., 1998; Hoshino & Thierry, 2011) assume that all activated lexical representations (target and non-target) compete for selection during lexical access in spoken word production. According to this view, selection is achieved by means of a top-down inhibitory mechanism external to the language system (Green, 1998) that "suppresses" the activation levels of non-target words (equipped with tags that determine their language membership). Green's (1998) ICM postulates that the higher the activation levels of lexical representations, the greater the amount of inhibition applied. Evidence for this control mechanism has been provided by numerous neuropsychological and neuroimaging studies (e.g., Abutalebi et al., 2008; Abutalebi, Miozzo, and Cappa, 2000; Fabbro, Skrap, and Aglioti, 2000).

Evidence for cross-language competition during lexical selection comes mainly from PWI studies (e.g., Costa et al., 2008; Hermans et al., 1998; Hoshino & Thierry, 2011). In these studies, two effects of crucial importance to the issue at hand were observed: (1) the semantic interference effect; and (2) the phono-translation effect. The semantic interference effect (which is observed when the distractor word in the non-target language is semantically related to the picture's name in the target language) and the phono-

translation effect (which occurs when the distractor word is phonologically related to the picture's name in the non-target language) have been taken as supporting evidence for the language-nonspecific process (Hoshino & Thierry, 2011). Hoshino and Thierry (2011) agree with Hermans et al. (1998) on the interpretation of these two effects as indexing cross-language activation and competition during lexical selection. However, Costa and Caramazza (1999) argue that the semantic interference effect actually reflects within-language competition and cannot be taken as conclusive evidence of the presence of cross-language competition. While there seems to be a disagreement on the interpretation of the semantic effect, the status of the phono-translation effect as an index of cross-language competition is uncontested. Unfortunately, the pattern of occurrence and strength of this effect has been inconsistent across the handful of studies that used this type of distratcor in the PWI task. Only one study (Hoshino and Thierry, 2011) found a significant phono-translation effect in the by-participant and by-items analyses in a monolingual PWI task (i.e., distractors were presented and pictures were named in L2). However, this study's stimulus list composition, namely the use of the picture names as distractors in the experiment, casts some doubts on the results obtained.

1.5.3 Bilingual lexical selection as a dynamic process

Finally, in recent years, a third alternative solution to the bilingual "hard problem" has been advanced and advocated by some researchers (e.g., Kroll et al., 2006), according to which bilingual lexical selection is a dynamic process which is by default language-nonspecific but can also operate in a language-specific way under certain conditions. Such a hypothesis is a theoretical claim worthy of further investigation, as it would explain the conflicting evidence that exists in the literature. Thus, further research needs to be conducted with different types of bilingual populations (in the proficiency continuum) and with different languages in order to determine whether different mechanisms are at play depending on a set of variables like level of proficiency, language context, frequency of use, etc., as suggested by some authors (e.g., Costa et al., 2006; Grosjean, 2013; Hermans et al., 2011; Kroll et al., 2006).

In the next two chapters we will present two different studies. The first is essentially of methodological value as it presents a normative database in TA for four psycholinguistic

variables (name agreement, familiarity, subjective frequency and imageability), a tool of crucial importance to conducting experimental research with an Arabic-speaking population. The second study is the main focus of this thesis and presents two experiments conducted with moderately-proficient TA-French bilinguals in a monolingual (Experiment 1) and bilingual (Experiment 2) context. We predicted that if bilingual lexical selection is a language-nonspecific process, we should observe the phono-translation effect in both Experiments 1 and 2.

Chapter 2: A standardized set of 400 pictures for Tunisian Arabic: Norms for name agreement, familiarity, subjective frequency, and imageability

Résumé

Les bases de données normatives sont largement utilisées dans la recherche sur le traitement du langage afin de contrôler un nombre de variables psycholinguistiques lors de la sélection des stimuli. Il y a un manque important de ce type de ressources pour la langue arabe et ses variétés dialectales. La présente étude avait pour objectif d fournir des données normatives en arabe-tunisien (AT) pour une banque de 400 images de Cycowicz, Friedman, Rothstein, et Snodgrass (1997) et qui inclut la banque de 260 images créées par Snodgrass et Vanderwart (1980). Les normes ont été recueillies pour les variables psycholinguistiques suivantes : accord sur le nom, familiarité, fréquence subjective et imagerie. La longueur des mots (en nombre de phonèmes et de syllabes) est aussi listée pour les mots dans la base de données. Des comparaisons effectuées entre les normes en AT obtenues et des données normatives pour le français, l'anglais et l'espagnol ont davantage mis en relief le caractère spécifique à la culture et à la langue des mesures susmentionnées. Cela met l'accent sur l'importance d'obtenir des normes pour ces variables dans des langues et des dialectes différents. Ainsi, cette base de données représente une ressource psycholinguistique précieuse qui répond aux besoins des chercheurs s'intéressant au traitement du langage chez des populations arabophones.

Abstract

Normative databases for pictorial stimuli are widely used in research on language processing in order to control for a number of psycholinguistic variables in the selected stimuli. Such resources are lacking for Arabic and its dialectal varieties. The present study aimed to provide Tunisian Arabic (TA) normative data for 400 line-drawings taken from Cycowicz, Friedman, Rothstein, and Snodgrass (1997) that include Snodgrass and Vanderwart's (1980) 260 pictures. Norms were collected for the following psycholinguistic variables: name agreement, familiarity, subjective frequency, and imageability. Word length data (in number of phonemes and syllables) are also listed in the database. Comparisons between the obtained TA norms and French, English and Spanish data further foreground the culturally and sociolinguistically specific character of the abovementioned measures, thereby highlighting the importance of obtaining norms for those variables in different languages and dialects. This database represents a precious and much-needed psycholinguistic resource for researchers investigating language processing in Arabic-speaking populations.

2.1 Introduction

It has long been established that standardized pictorial stimuli allow for a more reliable comparison between the results of different studies and better control of psycholinguistic variables. As a result, their use has become common practice in experimental as well as clinical research on language. Indeed, the effect of several psycholinguistic variables on spoken and written word processing has been extensively documented both among healthy and language-impaired populations in several languages (e.g., Alario et al., 2004; Barca, Burani, & Arduino, 2002; Barry, Morrison, & Ellis, 1997; Bonin, Boyer, Méot, Fayol, & Droit, 2004; Cortese & Schock, 2013; Cuetos, Ellis, & Alvarez, 1999). Therefore, minute control of such factors is of paramount importance for reliable and valid experimental design and results.

Over the years, Snodgrass and Vanderwart's (1980) pioneering set of 260 standardized pictures for American English has been extended (Cycowicz, Friedman, Rothstein, & Snodgrass, 1997) and norms have been collected for different languages, including French (Alario & Ferrand, 1999), Italian (Nisi, Longoni, & Snodgrass, 2000), Greek (Dimitropoulou, Duñabeitia, Blitsas, & Carreiras, 2009), and Spanish (Manoiloff, Artstein, Canavoso, Fernández, & Segui, 2010; Sanfeliu & Fernandez, 1996). Several of these studies have shown that variables such as name agreement and familiarity are culturally specific and vary from one language community to another. This highlights the importance of obtaining norms for different languages and even different culturally distinct varieties of the same language (e.g., Argentine Spanish vs. the Spanish spoken in Spain).

Psycholinguistic resources in Arabic for both pictorial and verbal stimuli are quite scarce and no extensive normative database exists for this language. A few computerized databases for modern standard Arabic (MSA) containing information regarding word frequency are available (e.g., Aralex; Boudelaa & Marslen-Wilson, 2010). However, the scope of their use is limited to the written variety of Arabic (i.e., MSA). The language situation in the Arab world is characterized by diglossia, a sociolinguistic condition where two varieties of the same language are used by a speech community for different functions and contexts (Ferguson, 1959). Dialectal Arabic (DA) is the medium of oral

communication and MSA that of formal written communication such as mass media (press, radio, and TV), textbooks, and official documents (Boudelaa & Marslen-Wilson, 2010, 2013; Daoud, 2001). Additionally, MSA and DA present some typological differences at the phonological, lexical and morpho-syntactic levels (Boudelaa & Marslen-Wilson, 2013). DA itself is further subdivided into several, and sometimes mutually unintelligible, varieties across the Arab world, including Tunisian Arabic (TA), the variety spoken in Tunisia.

Another difference between MSA and DA (and more specifically TA) is the manner of acquisition of these two varieties. While DA is acquired as a native language, MSA is acquired much later in a formal instruction context (namely, at school). In Tunisia, for example, TA is acquired as any first language, while instruction in MSA begins only at age six when children start primary school. Concerns have been raised with regards to the impact of the difference in acquisition modes of both varieties on the way they are processed during language production and comprehension (Boudelaa & Marslen-Wilson, 2013).

Therefore, research involving Arabic-speaking populations is in dire need of psycholinguistic databases for the different varieties of DA. Norms have been recently established for Levantine Arabic, one of the DA varieties spoken in the Middle-East (Khwaileh, Body, & Herbert, 2013). However, the ratings were collected for a different and smaller set *(n* = 186 pictures) than the commonly used Snodgrass & Vanderwart (1980) set (e.g., Alario & Ferrand, 1999; Cycowicz, Friedman, Rothstein, & Snodgrass, 1997; Dimitropoulou et al., 2009; Manoiloff et al., 2010; Nisi et al., 2000; Raman, Raman, & Mertan, 2013; Sanfeliu & Fernandez, 1996; Tsaparina, Bonin, & Méot, 2011). Additional norms are therefore needed in a spoken variety of Arabic for the extended and widely used (Cycowicz et al., 1997) 400-picture set which includes Snodgrass and Vanderwart's (1980) 260 line-drawings.

The language situation specific to each Arabic-speaking country is also an important factor to take into consideration. In Tunisia, for example, the language situation is a mixture of diglossia and societal bilingualism (Daoud, 2001). In addition to TA and MSA, the Tunisian sociolinguistic portrait is characterized by the marked presence of French in

formal as well as informal written and spoken communication and code-switching between TA and French is common in daily informal communication. TA itself is marked by numerous French lexical borrowings (e.g., /farʃitɑ/ in TA from French *fourchette*). Recent years have also seen the rise of English, which is gaining influence in daily communication, especially among the youth, and as the language of science (Daoud, 2001). Thus, we expect culturally-specific psycholinguistic variables to be influenced by and reflect this specific language situation for TA.

The aim of the present study was to establish a normative database in TA for the 400 line-drawings taken from Cycowicz et al. (1997). Norms were collected for name agreement and familiarity of the pictures, as well as the subjective frequency and imageability of their names. Values for word length (in number of phonemes and syllables) of the picture names were also listed.

Name agreement (NA) refers to the degree of variability in the names given to the picture across participants. A picture that elicits the same name by most subjects is said to have a high NA and a picture that elicits several different names has a low NA. This variable has been shown to be the most important predictor of naming latencies in picture-naming (Alario et al., 2004). Pictures that elicit different names take longer to be named because of the lexical competition that takes place between the different alternatives (Barry et al., 1997; Cuetos et al., 1999). Two possible loci of the NA effect have been identified depending on the cause behind low NA. If low agreement is caused by misidentification of pictures, then the locus is possibly at the level of structural encoding. However, if the variance in NA is the result of the availability of various correct names for the same object, then low NA possibly exerts its influence at the lexical level (Barry et al., 1997; Cuetos et al., 1999; Vitkovitch & Tyrrell, 1995). Many normative studies have shown that NA is culturally-specific and that variability in the names given to a picture may be greater or lower depending on the language and sociolinguistic context (Alario & Ferrand, 1999; Dell'acqua, Lotto, & Job, 2000; Dimitropoulou et al., 2009; Manoiloff et al., 2010).

Familiarity (FAM) refers to how common an object is in the language speakers' realm of experience. Some studies reported the effect of this semantic variable on naming latencies and accuracy among healthy and aphasic individuals, as pictures representing

more familiar objects are named faster and with fewer errors than those representing uncommon objects (Cuetos et al., 1999; Hirsh & Funnell, 1995; Kremin et al., 2001; Snodgrass & Yuditsky, 1996).The degree of an object's FAM also influences its recognition ease and speed and therefore a semantic locus has been suggested for this effect (Cuetos et al., 1999). Like NA, this variable is known to be highly influenced by cultural and linguistic differences (Alario & Ferrand, 1999; Manoiloff et al., 2010), as an object may be common in one culture but completely unfamiliar in another. For example, a picture depicting a baseball may be very common in a North American context but not in a European one.

Subjective Frequency (FREQ) refers to how often a word is used or heard in daily communication. Words that are used or heard more frequently are more easily accessed and retrieved than low-frequency words (Barry et al., 1997; Baus, Strijkers, & Costa, 2013; Cortese & Schock, 2013; Cuetos et al., 1999; Davies, Rodríguez-Ferreiro, Suárez, & Cuetos, 2013; Jescheniak & Levelt, 1994). Word frequency is estimated in two ways: objective or subjective. Objective word frequency refers to the sum of occurrences of a word in textual corpora, whereas the subjective frequency of a given word is estimated by the speakers of the language on a Likert scale, usually ranging from 1 to 7 (Desrochers & Thompson, 2009). Both objective and subjective frequency measures have been shown to be strongly associated and to be robust predictors of ease and speed of response in different types of task (Balota, Pilotti, & Cortese, 2001). In some studies, subjective frequency estimates proved to be a better predictor of visual and auditory word processing than objective frequency counts (Balota et al., 2001; Connine, Mullennix, Shernoff, & Yelen, 1990).

Imageability (IMA) refers to the ease and speed with which a given word evokes a mental image. This semantic variable influences performance on a number of tasks involving naming or recognition of words, as the semantic representations of picture names that easily evoke a mental image are accessed more quickly (Ellis & Morrison, 1998). Highly imageable words elicit faster reaction times and fewer errors than low-imageablity words (Alario et al., 2004; Cortese & Schock, 2013). IMA has been found to significantly

affect naming latencies even when the stimulus set consisted solely of pictures representing imageable concrete objects (Alario et al., 2004).

Word Length (WL) refers to how long a word is in number of phonemes (phWL) and syllables (syllWL). This variable has been shown to influence reaction times in several visual word recognition tasks (see Barton, Hanif, Eklinder Björnström, & Hills, 2014 for a review). It also interacts with frequency estimates since highly frequent words tend to be shorter (Dell'acqua et al., 2000).

2.2 Method

2.2.1 Participants

A total of 100 native speakers of TA participated in this study (mean education: 16 years; mean age: 24 years old, age range: 18-35 years; 51% females). They were recruited at the University of Carthage in Tunis, Tunisia. They had normal or corrected-to-normal vision and no history of language, learning or attention difficulties. Participants were randomly assigned to each one of the four tasks (n = 25 in each sub-group of the sample), so that each sub-group participated in only one of the tasks.

2.2.2 Materials

Four hundred black-and-white line drawings taken from Cycowicz et al. (1997) were used in the NA and FAM tasks. This set was constituted of the 260 pictures in Snodgrass and Vanderwart (1980) and 140 additional line-drawings constructed by Cycowicz et al. (1997).

For the FREQ and IMA tasks, ratings were collected for 348 picture names. This list consisted of TA words, French loanwords, as well as MSA words that are used in everyday oral communication in the Tunisian context.

Fifty-two pictures that have no name in TA and/or are usually referred to with their French name by Tunisian speakers were excluded from the original set of 400 stimuli. For example, the modal name of *skirt* in TA is the French word *jupe* (see Appendix A for

further examples). The MSA names of those objects were not included because they are not used by Tunisian speakers in everyday oral communication. The list of excluded 52 items also comprised different objects that shared the same name in TA (i.e., homonyms). For example, *box* and *can* both have the same name in TA: عُكَّة (the modal name given to both these pictures is in Appendix A), so subjective frequency and imageability ratings were collected only once for that word and were repeated for each homonym word (e.g., *box* and *can*) in Appendix A.

These stringent exclusion criteria were supported by the data obtained in the NA task presented here (see Results section for further details). Indeed, the modal names given by participants for the 52 finally excluded stimuli were either in French, did not correspond to the object represented by the picture, or were homonymous to the names of objects in the rated 348-word list.

2.2.3 Procedure

We used a computerized procedure in each of the four tasks. This allowed the homogenization of the data collection process (each stimulus was rated within the same time limit), as well as the proper randomization of stimuli in each task to control for order-of-presentation and fatigue effects. This computerized procedure has already been used in several studies to collect norms for NA (e.g., Bates et al., 2003; Cortese & Fugett, 2004; Dell'acqua et al., 2000; Severens, Van Lommel, Ratinckx, & Hartsuiker, 2005), as well as for FREQ and IMA (e.g., Desrochers & Thompson, 2009).

One picture-naming task (NA) and three rating tasks (FAM, FREQ and IMA) were run on a PC using the DMDX software (Forster & Forster, 2003). Each sub-group of participants (n = 25) completed each task in one experimental session. Stimuli were divided in four blocks and their order of administration was counterbalanced across participants. Within each block, items for the NA and FAM tasks (n = 100) and for the IMA and FREQ tasks (n = 87) were presented in a different random order for each participant.

A similar procedure was followed in all four tasks. Participants were tested individually in a quiet room and were seated in front of a PC monitor. At the beginning of each task, instructions in TA (adapted from Alario & Ferrand, 1999 for FAM and NA, and

from Desrochers & Thompson, 2009 for FREQ and IMA) appeared on the screen and were read aloud by the experimenter. Six practice items were administered before the experimental trials. In the rating tasks, the scale was presented before the practice set and on top of each image during the experiment. Participants used the numeric keys on the keyboard to enter their ratings. Each experimental trial ran as follows: a fixation point was presented at the center of the screen for 400 ms, immediately followed by the stimulus (either a word in TA or an image) presented at the center of the screen. The stimulus remained on the screen for 6000 ms in the ratings tasks and for 4000 ms in the picture-naming task. Opportunities for breaks were provided at the end of each block.

In the NA task, participants were instructed to orally name each of the 400 drawings with the first name that came to their mind. They were told that a name could consist of more than one word. If they could not give the name of the picture, they were asked to give one of these justifications in TA: “I don’t know the object” or “I don’t know the name”. Vocal responses were recorded with a microphone connected to the computer and the DMDX software (Forster & Forster, 2003).

In the FAM task, participants were asked to rate the familiarity of 400 objects represented by the pictures using a 5-point scale adapted from Alario and Ferrand (1999) where 1 = *very unfamiliar* images and 5 = *very familiar.* Participants were told that familiar objects were those they often encounter in their daily life while unfamiliar objects were unusual and rarely encountered.

In the FREQ task, participants were asked to rate the frequency of 348 names of the pictures (listed under the column “intended name” in Appendix A) using a 7-point scale (adopted from Balota et al., 2001) where 1 = words they *never encounter* and 7 = words they encounter *several times a day.* Subjective frequency was defined as the degree to which participants saw or came across a word in their daily life.

In the IMA task, participants rated the imageability of 348 picture names, namely the ease with which a given word elicited a mental image on a 7-point scale where 1 = a word *imaged with difficulty* and 7 = an *easily and quickly imageable* word (Desrochers &

Thompson, 2009). Participants were told not to worry about how often they used a given number on the scale as long as it faithfully represented their impression.

2.3 Results and discussion

A summary of the rating data obtained from our sample of TA-speaking subjects is presented in Appendix A. The database contains the following information for each picture: (1) the number assigned to each picture (first column), (2) the picture's name in English as in Cycowicz et al.'s (1997) database (second column), (3) the picture's intended and modal names (i.e., its most frequently given name) transcribed in Arabic script (third and fourth columns, respectively), (3) the modal name's English translation (fifth column), (4) two NA measures: the *H* statistic (Snodgrass & Vanderwart, 1980) and the percentage of participants giving the most common name in TA (sixth and seventh columns, respectively), (5) the means and standard deviations for FAM, FREQ and IMA (subsequent columns), and (5) WL (phWL and syllWL), as counted by the researchers, since this information is not available for TA (the two final columns). The different alternative names given to each picture in the NA task are listed in Appendix B.

The information statistic, *H*, was computed using the following formula developed by Snodgrass and Vanderwart (1980):

$$H = \sum_{i=1}^{k} p_i \log_2 \left({}^{1}/_{p_i} \right),$$

where *k* refers to the number of names given to the picture and p_i indicates the proportion of participants who gave the name. Naming failures ("I don't know the name", "I don't know the object", and no responses) were taken into account when computing the NA percentages but eliminated when computing the *H* statistic.

The lower a picture's *H* value, the higher its NA, and vice versa. For example, the picture of an airplane in the database has an *H* value of .0, which indicates that all subjects who responded used the same word to name the picture. On the other hand, the picture of a totem has an *H* value of 3.02 indicating very low NA (namely, several different names were given to that picture).

According to Snodgrass and Vanderwart (1980), the *H* statistic is a more reliable measure of the distribution of picture names than the NA percentage. For example, a picture could have 92% NA but an *H* value of .0 (i.e., perfect NA) if all the subjects who gave a response used the same name. However, the percentage NA is also important as a complementary measure to the *H* statistic, since it gives us more detailed information about which items elicited a response from every single subject in the sample and which ones caused naming failures.

2.3.1 Description and analysis of the normative data

Table 1 presents the summary statistics for all the variables in the database (NA, FAM, FREQ, IMA, and WL). Both measures of NA (*H* and %) seem to indicate a low level of NA for most pictures with *M* = 1.20 and *SD* = 0.84 for the *H* statistic and *M* = 59% and *SD* = 28.70% for the percentage measure. Only 53 pictures showed perfect NA (*H* = .0), which indicates a great variability in picture names given by participants. This may be partly accounted for in terms of regional dialect variations across participants. TA's regional varieties are mutually intelligible but present a few differences that include object names. Therefore, one object may have a different dominant name from one speaker's region to another (for example, a faucet is named /sabɛlɑ/ in the capital city Tunis and /ʃɪʃmɑ/ in other Tunisian regions). It is also noteworthy that some of the items showing an *H* value of .0 had a percentage slightly below 100 (e.g., *barrel* has an *H* value of .0 but 72% NA).This is due to the fact that some pictures had naming failures (mostly no responses).

Three pictures had 0% NA, namely the participants' responses were all different and no single most common name could be identified. One of these pictures (*fire hydrant*) failed to elicit a response from any of the participants, which can be explained by the fact that this object has no name in TA and is unfamiliar in a Tunisian context (*M* = 2.46, *SD* = 1.35). Seventeen pictures in the set were misidentified (for example, the modal name for the picture of a thimble was صْطَل [*bucket*]) due to the unfamiliarity of these objects in a Tunisian context (*M*= 2.63, *SD* = 1.17). Nine out of these 17 pictures were in the list of 52 pictures excluded from the FREQ and IMA tasks. Additionally, 42 pictures were given French names by participants (for example, the modal name for the picture of a screwdriver was its French equivalent, *tournevis*). Eighteen of these were in the excluded 52-picture set,

the rest have existing names in TA, albeit less frequent (M = 3.79, SD = 1.60). For example, the modal name of the picture of a hat was the French word *chapeau*, while the intended TA name for this object was: طَرْبُوشَة. This reflects the marked interaction of French with TA in Tunisia (Daoud, 2001).

The results of the NA task support two methodological choices: (1) the exclusion of the 52 items (items number 348 to 400 in the database) from the word rating tasks, and (2) collecting the FREQ and IMA ratings for the intended names rather than for the modal ones. As explained above, 4.3% of the pictures' modal names reflected misidentifications of the objects represented by the pictures, and 10.5% were in French. Therefore, in order to obtain ratings for as many TA words corresponding to the pictures as possible, we chose to simply translate the English names in Cycowicz et al. (1997) into their equivalent TA names.

The ratings of the FAM and FREQ tasks indicate that pictures and their names were partially familiar to TA subjects (M = 3.51, SD = 0.72 and M = 3.98, SD = 1.17, respectively). The IMA task data, on the other hand, show that most names easily evoked a mental image to participants (M = 5.73, SD = 0.84), which is not surprising seeing that all names in the set represent concrete objects.

Table 1: Summary statistics for all TA variables

	NA/*H*	NA%	FAM	IMA	FREQ	phWL	syllWL
Mean (*M*)	1.19	59.07	3.51	5.72	3.97	5.83	2.19
Median	1.21	60.00	3.56	5.98	3.98	6.00	2.00
Standard deviation (*SD*)	0.84	28.69	0.72	0.83	1.17	2.05	0.88
Asymmetry	0.21	-0.14	-0.19	-1.92	0.05	1.34	0.66
Kurtosis	-0.91	-1.22	-0.70	4.35	-0.66	2.16	0.44
Range	3.32	100	3.25	4.95	5.40	11.00	4.00
Minimum value	0.00	0.00	1.67	1.80	1.44	3.00	1.00
Maximum value	3.32	100	4.92	6.75	6.84	14.00	5.00
25th percentile	0.4	40	3.08	5.46	3.12	4	2
75th percentile	1.76	88	4.12	6.27	4.84	7	3
Interquartile range	1.37	48.00	1.04	0.81	1.72	3.00	1.00

Note: N = 400 for NA and FAM, N = 348 for IMA, FREQ, phWL, and syllWL; H, information statistic; NA, name agreement; NA%, name agreement percentage; FAM, familiarity; IMA, imageability; FREQ, subjective frequency; phWL, word length in number of phonemes; syllWL, word length in number of syllables.

2.3.2 Correlations among TA variables

Correlational analyses were conducted among all TA variables (NA% and *H*, FAM, IMA, and FREQ). Three items were removed from the percentage NA data (the ones that have 0% NA) and one from the NA/*H* data (*fire hydrant*, which elicited no names) when doing the analyses.

The correlation matrix is presented in Table 2. Significant correlations were found among all of the abovementioned variables (all *p*s < .01). As expected and as found in previous studies (Alario & Ferrand, 1999; Manoiloff et al., 2010), a strong negative correlation (r = -.91) was found between the two measures of NA, NA/*H* and NA %. A strong positive correlation was also found between FAM and FREQ (r = .74). The weakest correlation was between FREQ and NA/*H* (r = -.35). Additionally, moderate correlations were found among the rest of the variables.

The strong relationship found between FAM of the pictures and their names in TA seems to indicate that the names of the most familiar objects are also the most frequently used and heard in daily communication. The positive significant and moderate correlations between IMA and both FAM (r = .53) and FREQ (r = .69) indicate that the most familiar objects' names are also the quickest to evoke a mental image. The positive correlations between FREQ and both measures of NA suggest that retrieval of the picture names was easier when objects and their names were more frequent, which is expected, as both of these variables have an effect on picture naming.

Correlations were also performed between all four TA variables and WL (both phWL and syllWL). Most correlations were significant at p < .01 (phWL and FAM were significant at p < .05), except for the correlation between FAM and syllWL (p = .06). The strongest correlation was found between phWL and syllWL in (r = .88) and the weakest between IMA and syllWL (r = -.15). All other correlations were weak and negative.

The significant and negative correlations found between WL (both phWL and syllWL) and both IMA and FREQ, albeit weak, suggest that most frequent words are also shorter and evoke a mental image more quickly. The significant and positive correlations between NA/*H* and WL (phWL and syllWL) indicate that longer words are more inclined

to have other possible names. The significant and negative correlation between NA% and WL (phWL and syllWL) variables suggests that the longer the word, the more difficult it is to name it.

Table 2: Correlations among all TA variables

	NA/*H*	NA%	FAM	IMA	FREQ	phWL	syllWL
NA/*H*	1						
NA %	-.91**	1					
FAM	-.39**	.52**	1				
IMA	-.40**	.54**	.53**	1			
FREQ	-.35**	.49**	.73**	.69**	1		
phWL	.21**	-.24**	-.13*	-,22**	-.33**	1	
syllWL	.21**	-.22**	-.100	-.15**	-.25**	.88**	1

Note: *H*, information statistic; NA, name agreement; NA %, name agreement percentage; FAM, familiarity; IMA, imageability; FREQ, subjective frequency; phWL, word length in number of phonemes, ; syllWL, word length in number of syllables.
*$p < .05$
**$p < .01$.

2.3.3 TA versus English, French, and Spanish norms

Table 3 presents descriptive data for NA, FAM, IMA, and FREQ in TA, French, English, and Spanish. Comparisons and correlations between TA and both French and Spanish norms were carried for NA and FAM (taken from Alario & Ferrand, 1999 and Manoiloff et al., 2010, respectively) for the whole 400-picture set. Additionally, we carried comparisons and correlations between the present NA and FAM norms and English ones on the 260 pictures in common. Seeing that FREQ and IMA ratings were not available for the whole set, we extracted the stimuli for which norms were available in French, Spanish and English (see Table 3 for details).

From a descriptive point of view, the most important differences were between the two measures of NA in TA and other languages. The NA/*H* value was much higher and NA% much lower in TA than in English, French, and Spanish. With respect to FAM, TA ratings were higher than the French ones. However, there were no remarkable differences between TA and English FAM ratings. Overall, pictures were rated as being more familiar

to the Tunisian sample. There were no differences of note between TA ratings and those in other languages for FREQ and IMA.

The correlation matrix between the ratings collected for TA and English, French and Spanish norms is presented in Table 4. Significant (at .01 and .05 levels) and positive correlations were found between norms in TA and other languages, except for IMA in Spanish (p = .09). The strongest correlations were found between TA and both French and English norms of FAM (rs = .70 and .78, respectively). All other correlations were weak to moderate.

The weak correlations found between TA and French, English and Spanish measures of NA as well as the comparison between descriptive data for this variable in all languages suggest that it was much more difficult to generate a single most common name for TA speakers than for English, French, or Spanish ones. The association between TA and other languages for FAM and FREQ seems to indicate that pictures and their names are equally familiar for Tunisian speakers and speakers of other languages. IMA and NA seem to be the most influenced by cultural context and language in our TA database since they both present the weakest correlations with norms in the other languages. In other words, it seems that the ability to generate names for the objects represented by the pictures (i.e., NA) or mental images for the names of the objects (i.e., IMA) highly depends on language. This is in line with similar comparisons performed in previous normative studies where NA has been shown to be the most affected by cultural differences (Alario & Ferrand, 1999; Dell'acqua et al., 2000; Manoiloff et al., 2010; Sanfeliu & Fernandez, 1996).

Table 3: Mean (M) and standard deviation (SD) for all variables in TA, French, English, and Spanish

	TA		French		English		Spanish	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
NA/H	1.20	0.84	0.35	0.43	0.56	0.53	0.71	0.62
NA %	59	29	84	21	86	14	81	21
FAM	3.51	0.72	2.70	1.21	3.29	0.96	2.81	1.08
IMA	5.76	0.80	6.32	0.87	5.95	0.33	6.08	0.51
FREQ	4.05	1.17	3.90	1.27	5.38	0.60	5.77	0.90

Note: NA/*H*, name agreement information statistic; NA%, name agreement percentage; FAM, familiarity; IMA, imageability; FREQ, subjective frequency.

Table 4: Correlations between TA and French, English and Spanish norms for NA, FAM, IMA, and FREQ

	French	English	Spanish
NA/*H*	.28**	.39**	.14**
NA %	.29**	.36**	.15**
FAM	.69**	.78**	.32**
IMA	.12*	.18**	.09
FREQ	.21**	.66**	.48**

Note: NA/*H*, name agreement information statistic; NA % , name agreement percentage; FAM, familiarity; IMA, imageability; FREQ, subjective frequency. For NA and FAM, comparisons between TA and both Spanish and French norms are for all 400 pictures and for 260 pictures in the comparison with English norms. For IMA and FREQ, comparisons were carried out on 320 words for French, 189 and 193 words for Spanish, and 199 and 203 words for English.
*$p < .05$
**$p < .01$

2.4 Conclusion

The aim of the present study was to create an extensive standardized database of 400 pictures and 348 words for TA. The database contains norms for five important psycholinguistic variables: NA, FAM, IMA, FREQ and WL (phWL and syllWL).

Evidence has shown that each of these variables influences different stages of language processing in different experimental tasks and in different languages. NA, the degree to which the speakers of a language agree on the names of objects, has consistently been shown to be the most robust determinant of naming latencies in picture-naming tasks (e.g., Alario et al., 2004). The effect of FAM in this task is somehow mitigated but some studies have found a significant influence of this variable. For example, Hirsh and Funnell (1995) have identified FAM as a strong predictor of picture naming latencies in semantic dementia patients. The influence of this variable has somehow been equated to that of FREQ with each variable affecting different stages of processing. While the FAM effect can be located at the level of semantic activation, FREQ has been known to significantly affect reaction times in picture-naming, reading, and lexical decision tasks (e.g., Davies et al., 2013). WL has also been found to affect word reading. For example, Davies et al.

(2013) found that the reading performance of healthy and dyslexic Spanish children was affected by WL with longer words taking more time to be read.

The influence of the abovementioned variables on processing in Arabic has been the object of little or no inquiry. The present database thus offers the opportunity to investigate the effects of each of the five variables in a spoken variety of Arabic. To the best of our knowledge, this study is the first to offer such a sizeable normative database for Arabic and will be of great use in research involving this language. It provides the means to proper control in experimental studies involving Arabic-speaking subjects, both healthy and impaired, and will allow their comparability with other intra- and cross-linguistic studies.

Chapter 3: The bilingual 'hard problem' in spoken word production among Arabic-French bilinguals

Résumé

Bien qu'il y ait un consensus dans la littérature au sujet de l'activation interlinguistique pendant la production de mots chez les bilingues, la notion de compétition lexicale demeure matière à débat. La présente étude avait pour objectif d'investiguer la nature du processus de sélection lexicale dans deux contextes expérimentaux différents (unilingue vs. bilingue) chez des bilingues tardifs qui sont modérément compétents dans leur L2 et dont les deux langues sont typologiquement distantes : l'arabe tunisien (AT) et le français. Nous avons employé la tâche d'interférence image-mot dans deux expériences où des bilingues AT-français devaient nommer des images dans leur L2 (français) tout en ignorant des distracteurs en L2 (Expérience 1; contexte unilingue) ou en L1, AT (Expérience 2; contexte bilingue). Les résultats ont révélé des interactions inter-linguistiques significatives dans l'Expérience 2 mais absentes dans l'Expérience 1. Ces résultats indiquent que la présence de compétition inter-linguistique lors de la sélection lexicale dépend du contexte langagier et que la langue non-cible interfère avec la production dans la langue cible dans le contexte expérimental bilingue mais pas dans le contexte unilingue. Cette étude vient donc soutenir la théorie selon laquelle la sélection lexicale chez les bilingues serait un processus dynamique pouvant fonctionner de façon spécifique ou non-spécifique à la langue, et ce dépendamment de certaines variables (dont l'une est le contexte langagier).

Abstract

While there is general consensus in the literature on the presence of cross-language activation during bilingual word production, cross-language competition during lexical selection remains a matter of debate. The present study aimed to investigate the nature of the lexical selection process in two different language experimental settings (monolingual vs. bilingual) among late moderately proficient bilinguals whose two languages are typologically distant: Tunisian Arabic (TA) and French. In two picture-word interference experiments TA-French bilinguals were asked to name pictures in their L2 (French) while ignoring distractors in L2 (Experiment 1; monolingual setting) or L1, TA (Experiment 2; bilingual setting). Results showed significant cross-language interactions present in Experiment 2 but absent from Experiment 1. These findings indicate that the presence of cross-language competition depends on the language setting and that the non-target language interferes with production in the target language in a bilingual experimental setting but not in a monolingual one. This study provides some evidence for the idea that bilingual lexical selection is a dynamic process that can operate in a language-specific or non-specific way depending on language context, among other variables.

3.1 Introduction

As in monolinguals, spoken word production among bilinguals typically involves the retrieval of the lexical entry corresponding to the concept. During this process of lexical selection the semantic features of the target concept spread activation to the target lemma and other lexical entities sharing some of the target concept's semantic features. These lemmas will spread activation to their corresponding lexemes which in turn will activate phonologically related lexemes and their corresponding lemmas (Levelt et al., 1999). All these representations then compete with each other for selection and the lexical item that achieves the highest level of activation is selected (Dell, 1990). This process is more complicated among bilinguals, as representations from both languages are activated. For example, when a French-English bilingual tries to name the picture of a cat, the equivalent lexical representations of both languages, *chat* and *cat*, as well as other related lemmas and lexemes will be activated (e.g., *souris*, *château*; *mouse*, *castle*), regardless of the language the bilingual intends to speak in. Key evidence for this cross-language activation has been provided by several studies (Colomé & Miozzo, 2010; Colomé, 2001; Hermans et al., 2011). If several lexical alternatives from both languages are activated, how, then, are bilinguals successfully able to produce speech in the intended language? More to the point is lexical competition during bilingual spoken word production restricted to the target-language lexicon or does it involve lexical items from both languages? One view (Costa & Caramazza, 1999) posits that bilingual lexical selection is language-specific, which means that competition during lexical selection is restricted to the target language's lexicon. Another view (Green, 1998; Hermans et al., 1998) holds that bilingual lexical selection proceeds in a language-nonspecific manner, namely that lexical competition is cross-linguistic.

Thus far, experimental studies investigating the nature of bilingual lexical selection have yielded conflicting and inconclusive evidence. Among the first of such studies is Hermans et al.'s (1998) seminal picture-word interference (PWI) study. The authors hypothesized that target and non-target language lexical items are both activated and compete for selection during bilingual lexical access.

In two experiments, Dutch-English highly-proficient bilinguals named pictures in their L2 (English) while ignoring auditory distractor words in L2 (Experiment 1) or L1 (Dutch) (Experiment 2). Distractors were either semantically or phonologically related to the picture name in English. For the purposes of their study, Hermans et al. (1998) developed a new type of distractors that are phonologically related to the name of the picture in the non-target language. For example, they would present the picture of a mountain with the distractor « bench » which is related to the name of the picture in Dutch (« berg »). The authors hypothesized that the distractor not only activates the lemma and lexeme of « bench » but also that of « berg » which is, potentially, a competitor to « mountain ». Therefore, the authors assumed that this distractor (called phono-Dutch in their study and subsequently dubbed as 'phono-translation' in other studies) will result in an interference effect indicating that « mountain » and « berg » do indeed enter into lexical competition. Finally, an unrelated distractor condition was also presented. In addition, the delay between the picture and the distractor presentation (stimulus onset asynchrony or SOA) was also varied with four SOAs of -300, -150 before the presentation of the picture, 0 ms (i.e., the distractor and the picture were presented simultaneously), and 150 ms after picture onset. This was done in order to determine the probable locus of cross-linguistic interaction.

The processing stage at which the distractor interacts with the target picture name will differ depending on the SOA at which it is presented. For example, when the semantic condition is presented before or at the same time as the picture, the distractor lemma should interfere with the picture's lemma selection process (Indefrey & Levelt, 2004). Following the same logic, the semantic distractor should not yield any effects when it is presented at a later SOA (e.g. 150 ms after picture onset) because the target lemma will have been selected and the picture name will be at the lexeme retrieval stage (Hall, 2011). In the phonological condition, when the distractor is presented 150 ms after picture onset, naming latencies are faster than in the unrelated condition (i.e., the phonological distractor facilitates naming) (Indefrey & Levelt, 2004; Roelofs, 1997). Surprisingly, this effect is also observed at early SOAs (Hermans et al., 1998). Thus, the phonological distractor seems to facilitate both the lemma and lexeme retrieval stages. Finally, interference effects caused by the phono-translation distractors have been observed at SOAs -150 and 0 ms

(Costa et al., 2003, Experiment 1; Hermans et al., 1998; Hoshino & Thierry, 2011), as well as SOA +150 ms (Costa et al., 2003).

The phono-translation effect has two possible loci: semantic and phonological. Seeing that the semantic interference effect has its locus at the lemma retrieval stage of lexical access (Indefrey & Levelt, 2004; Roelofs, 1992), if the phono-translation effect is observed at the same SOAs at which semantic interference is observed (i.e., early SOAs), then one may assume that the interference takes place at the lemma selection process. However, if the effect is also observed at later SOAs (at which phonological facilitation appears) then the phono-translation interference is assumed to extend to the lexeme retrieval stage (Hermans et al., 1998). This phono-translation effect became the most important index of cross-language lexical competition in the PWI task.

Hermans et al. (1998) found a weak phono-translation effect in Experiment 1, where the task was purely monolingual, as it was found only in the by-participant analysis in SOA 0 ms. In Experiment 2 (bilingual experimental setting), however, the effect was more robust. The authors concluded that lemmas (and subsequently, the lexemes) from both languages are activated and enter into competition during bilingual lexical access. To account for this difference in the phono-translation effects observed in Experiments 1 and 2, Hermans et al. (1998) proposed two possible explanations. First they argued that the unreliable phono-translation effect obtained in Experiment 1 could possibly be due to the small overlap between the first phonemes of the English phono-translation distractor and the initial phonemes of the Dutch picture name. Second, they put forth that the robust phono-translation effect observed in Experiment 2 could be due to the strong activation received by the non-target language from the L1 distractor. The authors draw support for this idea from Grosjean's (2001) language mode hypothesis according to which, in bilinguals, the target language is much more activated than the non-target language in a monolingual mode (i.e., when only one language is used), whereas both languages are highly activated in a bilingual mode (i.e., a setting where both languages are present). However, in their study, the phono-translation interference effect was not completely absent in their first experiment where the experimental setting was monolingual. However,

since the effect found in Hermans et al. (1998) was not robust, no strong conclusions could be drawn with regards to the nature of the bilingual lexical selection process.

Two other studies replicated the phono-translation effect (Costa et al., 2003; Hoshino & Thierry, 2011) found in Hermans et al's (1998) first experiment. However, in Costa et al.'s (2003) study, the effect was again significant only in the by-participant analysis and marginal in the by-items analysis. Hoshino and Thierry (2011) conducted a similar experiment with 27 highly proficient Spanish-English bilinguals but with only one SOA at 0 ms and found a significant phono-translation effect. However, the repetition of picture names as distractors in their stimulus set seems to have created some methodological issues that caused interference instead of facilitation to appear in the phonological condition. It is also possible that the observed interference effect in these reported studies was due to the proximity of both language subsystems (e.g., English and Dutch in Hermans et al., 1998). van Heuven, Conklin, Coderre, Guo, & Dijkstra (2011) have found that cross-language similarity may play a role in cross-language interactions in a Stroop task.

Another study was conducted with highly proficient bilinguals whose languages were typologically distant, i.e. Persian and French (Deravi, 2009). To the best of our knowledge, this study has been the only one to address this issue in the PWI task with such different languages. Deravi (2009) studied bilingual lexical selection in three experiments. In the first two, participants named pictures in their L2 (French) while ignoring distractors in their L1 (Persian). Distractors were presented auditorily in experiment 1 and visually in experiments 2 and 3. In the third experiment, pictures were to be named in L1 and auditory distractors were presented in L2. All three experiments produced conflicting results that were very difficult to interpret as indexing a language-specific or a language-nonspecific selection mechanism. Most notably, the phono-translation condition yielded conflicting results with facilitation instead of interference at SOA -150 ms, and an interference effect at SOA +150 ms. This inconclusive set of results obtained in Deravi (2009) may stem from some of the methodological issues present in the study (for example, a number of psycholinguistic variables like word frequency were not controlled for in this study).

In the present study, we aimed to investigate the lexical selection process among bilinguals whose languages are typologically distant: Tunisian Arabic (TA) and French using the PWI task in two experiments, as in Hermans et al. (1998). In Experiment 1, the language setting is entirely monolingual, whereas in Experiment 2 it is bilingual. This allowed us to investigate whether language experimental setting influenced how processing operates among bilinguals. We predicted that if bilingual lexical selection is a language-nonspecific process, we should observe the phono-translation effect in both Experiments 1 and 2. We also predicted that in both experiments we should observe a semantic interference and a phonological facilitation effects as in previous PWI studies (Costa et al., 2003; Hermans et al., 1998).

3.2 Experiment 1: Bilingual word production in a monolingual setting

In this experiment, TA-French bilinguals named pictures in their L2 (French) while ignoring an L2 auditory distractor. The aim of this experiment was to investigate cross-language activation and competition in a purely monolingual experimental setting where the non-target language (TA) was absent.

If cross-language competition extends to a purely monolingual setting (as in Hoshino & Thierry, 2011), a phono-translation interference effect (i.e., slower naming latencies in the phono-translation condition relative to the unrelated condition) is predicted. The phono-translation distractor will activate the picture name in the non-target language, thus causing it to interfere with the selection of the picture name in the target language. Additionally, semantic interference (i.e., slower naming latencies in the semantic condition relative to the unrelated condition) as well as a phonological facilitation effects (i.e., faster naming latencies in the phonological condition relative to the unrelated one) are also predicted.

3.2.1 Method

3.2.1.1 Participants

Twenty-four TA-French bilinguals students at Université Laval, Quebec City, Canada, participated in Experiment 1 (age: M = 27.3 years old, SD = 3.6, range = 22-36 years old; education: M = 19.7 years of education, SD = 2). Participants received a

monetary compensation for their participation (20 $) and signed two consent forms (in French) of the ethics committee of the Centre de recherche de l'Institut universitaire en santé mentale de Québec (CRIUSMQ). The first form, signed before the experiment began, made only partial divulgation of the aims of the experiment, as it informed participants that the research was on language processing. The second form, signed at the end of the experiment, informed the participants of the real aims of the research (i.e., to investigate bilingual language processing). All were native speakers of TA and learned French as a second language at primary school (M = 7.1 years old, SD = 1.3). Participants' proficiency was assessed by means of self-ratings on a 7-point Likert scale as part of a language history questionnaire (Grosjean, *personal communication*) and, following (Primativo et al., (2013), a lexical decision task used as a vocabulary test.

The lexical decision task used in this study was developed by Karel Potvin (unpublished master's essay, 2013). It consisted of 120 low-frequency words and 120 non-words. Participants were asked to decide whether a given stimulus was a real word in French or not by pressing the button corresponding to their response on the keyboard. The task was run on the DMDX software (Forster & Forster, 2003) as follows: a fixation point appeared for 400 ms after which the stimulus appeared at the center of the screen for 1500 ms or until participants responded.

A proficiency score was computed for each participant from their performance on the lexical decision test using Meara's (1992) ΔM formula:

$$\frac{h-f}{1-f}-\frac{f}{h}=\Delta M,$$

where h = proportion of correctly recognized words (hit rate), and f = proportion of incorrectly accepted non-words (false alarm rate). ΔM was introduced by Meara (1992) as a score reflecting L2 vocabulary size based on performance in lexical decision tasks. This score ranges from 0 to 1 and represents the proportion of words within the range that is known by the participant (Lemhöfer & Broersma, 2012).

The results indicate that our TA-French bilinguals were moderately proficient (M = 0.28 ΔM, SD = 0.24). Highly-proficient bilinguals have a large vocabulary size, often

almost equivalent to that of their L1. By contrast, moderately proficient bilinguals have a smaller vocabulary, i.e., know much fewer words especially in the low-frequency range (Primativo et al., 2013), as indicated by our participants' scores in the lexical decision task. Our participants are therefore at an intermediary level of L2 proficiency, namely they are more proficient than speakers who just began learning French and whose vocabulary knowledge is very limited in that language but not as proficient as L2 speakers who have an extensive and near-native mastery of the language. The self-ratings, however, indicated a higher level of L2 proficiency (see Table 5).

It has been demonstrated that lexical decision is a more reliable measure of L2 vocabulary size than self-ratings, especially in experimental contexts (Lemhöfer & Broersma, 2012). In several studies investigating bilingual word processing, researchers relied on this measure to assess their bilingual's sample lexical proficiency in L2 (e.g., Christoffels et al., 2007; Hermans et al., 1998; Primativo et al., 2013). Similarly, we chose to take the lexical decision score as a measure of participants' proficiency. This is especially relevant seeing that the lexical decision task was used to assess vocabulary size and that the present study focuses on bilinguals' mental lexicon. Their lexical proficiency is then what is most relevant here.

Table 5: Self-assessed proficiency on a 7-point Likert scale in L2 for participants in Experiment 1

	Mean	SD
Production	5.58	1.14
Comprehension	6.46	0.78
Writing	5.71	1.00
Reading	6.42	0.83

3.2.1.2 Materials

The target stimuli were 22 line-drawings of common objects for the main experiment and eight pictures for the training session. All pictures were selected from Alario & Ferrand's (1999) French normative database. They were matched for familiarity and name agreement. Values for these variables were taken from Alario and Ferrand's normative database (1999).

Four French words were selected for each picture to serve as distractors in the following conditions: (1) phono-translation (the distractor is phonologically related to the picture name in the non-target language), for example, *chapeau* /ʃapo/ (*hat*) (target picture: a candle, *bougie* in French; TA name: /ʃamʕɑ/); (2) semantic (the distractor and target picture are semantically related), for example, *ampoule* (*light bulb*) for the target picture of a candle; (3) phonological (the distractor holds a phonological relationship with the picture name in the target language), for example, *bouée* (*rubber ring*) for the target picture of a *bougie*; and (4) unrelated (the distractor holds no relation of any kind to the picture name), for example, *feuille* (*leaf*). Following Hermans et al. (1998), special care was taken to ensure that the association between the semantic distractor and the target was not too strong, as a strong semantic relationship could result in facilitation rather than interference. Also, the semantic distractor was not phonologically related to the picture name in either language (for example, semantically related pairs such as *chien-chat* [dog-cat] were not included since they are also phonologically related in French). Finally, phonological and phono-translation distractors were not semantically related to the target picture. All distractors were non-cognates and were matched for subjective frequency, imageability, and word length (in number of phonemes, letters, and syllables). Values for these psycholinguistic variables were taken from the lexical database for French, *Lexique 3.0* (New, Pallier, & Ferrand, 2005) and Ferrand et al.'s (2008) estimates. All distractors were spoken by a native French speaker. A list of picture names in French, their translation in English as well as the distractors used in each condition are presented in Appendix C.

3.2.1.3 Procedure

A 4 (distractor type: phono-translation, semantic, phonological, and unrelated) x 3 (SOA: -150, 0, and +150 ms) within-participants factorial design was used. The distractor was presented 150 ms before picture onset, at the same time as the picture (0 ms), and 150 ms after picture onset.

Stimulus presentation was blocked by SOA condition, i.e., in each block there was only one SOA condition. Each of the three SOA conditions was further divided into four blocks of 22 trials each. All 22 pictures were presented once within a given block. Thus, in each SOA condition, each picture was seen four times, each with a different distractor.

The order of presentation of the three SOA conditions was counterbalanced across participants. There were, then, six possible SOA combinations and an equal number of participants were presented with each one of these combinations. Block order presentation within a given SOA condition, as well as the order of the trials within the blocks, was randomized across participants.

Participants were tested individually in a sound-proof room at Centre Apprentiss, Faculté de médecine, Université Laval. Before the experiment began, participants were explicitly asked to communicate with the experimenter only in French (the target language) and not to use their native language until the end of the experiment. Additionally, all experimental instructions were given in French to ensure that the non-target language (TA) was completely absent from the experiment, as in Hoshino and Thierry (2011). Participants were seated in front of a computer monitor. Similar to Hermans et al. (1998), a familiarization phase preceded the experimental session. Each participant was presented with a booklet of 30 pictures (including the 22 pictures involved in the experiment). The name of each picture was printed in French underneath it and participants were asked to use only these words to name the pictures. After participants saw all drawings, they were presented with another booklet with the same line-drawings, this time without the printed word, and were instructed to name these pictures. Next, a practice block of 8 trials was administered. The experimental blocks followed and participants were allowed to take regular breaks between blocks.

The DMDX software (Forster & Forster, 2003) was used to present the stimuli and record the response onset by means of a headset with a microphone. The naming latencies were measured from picture onset until response onset. Each trial started with a blank screen that lasted for 1000 ms and was followed by a fixation point (*) that appeared on the centre of the screen and remained for 500 ms. After the fixation point, a blank screen appeared for 500 ms after which the picture appeared on the centre of the screen and remained there for a maximum of 2000 ms. The distractor was spoken through the headphones either 150 ms before the picture appeared on the screen (i.e., 350 ms after the fixation point), at the same time, or 150 ms after picture onset. All RTs were extracted from recorded responses using the CheckVocal programme (Protopapas, 2007).

Once the experimental session was finished, participants were allowed to take a break and were then asked to do the lexical decision task and fill in the language history questionnaire.

3.2.1.4 Data analysis

The linear mixed effects modeling approach, a type of analysis that controls for the crossed random effects of participants and items (Baayen, Davidson, & Bates, 2008) with distractor type (semantic, phonological, phono-translation, and unrelated) and SOA (-150, 0 and 150 ms) as within subjects factors was used for data analysis. Reaction times (RTs) were introduced in the model as dependent variables. Error rates (Experiment 1 mean percentage: 3.58%; Experiment 2 mean percentage: 4.04%) were not high enough to allow for analysis in either experiment.

Comparisons of each of the phono-translation, semantic and phonological distractor conditions with the unrelated one were also carried out to establish any effects of the phono-translation, semantic and phonological distractors. Data analyses were run in SPSS22.

3.2.2 Results

Mispronunciation errors were removed from the analysis of RTs along with responses that were 3 standard deviations above or below each participant's overall mean. This resulted in the exclusion of 5.57% of the total data.

Tables 6 and 7 show the mixed model analysis estimates and tests of fixed effects by RTs. Distractor type significantly affected RTs ($ps < .05$). The phonological distractor (M = 749.14 ms, SD = 195.49) was significantly faster than the unrelated condition (M = 765.08 ms, SD = 194.46). No significant differences were found between the unrelated and the phono-translation or semantic conditions. Also, SOA affected RTs. SOA 0 ms (M = 786.32 ms, SD = 197.60) was significantly slower than the other two SOA conditions (SOA -150 ms: M = 741.28, SD = 177.35; SOA +150 ms: M = 748.35, SD = 205.67). The interaction distractor x SOA did not reach significance.

Table 6: Mixed model analysis estimates and tests of fixed effects in Experiment 1

Parameter	F	Numerator df	Demoninator df	Sig.
Intercept	1026.76	1	27.39	0.000*
SOA	47.80	2	5876.25	0.000*
Distractor type	3.758	3	5878.05	0.010*
SOA x Distractor type	.65	6	5876.19	0.694

*$p < .01$

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Table 7: Mixed model analysis estimates and tests of simple effects for Distractor and SOA in Experiment 1

Parameter	F	Numerator df	Denominator df	Sig.
Distractor 1 vs 4	0.01	1	2907.78	0.910
Distractor 2 vs 4	2.37	1	2917.30	0.124
Distractor 3 vs 4	8.75	1	2935.72	0.003*
SOA 1 vs 2	91.60	1	3898.41	0.000*
SOA 1 vs 3	2.71	1	3925.34	0.100
SOA 2 vs 3	53.87	1	3885.33	0.000*

Note: Distractor 1, phono-translation distractor; distractor 2, semantic distractor; distractor 3, phonological distractor; distractor 4, unrelated distractor; SOA 1, SOA -150 ms; SOA 2, SOA 0 ms; SOA 3, SOA +150 ms.
*$p < .01$

3.2.3 Discussion

The results of Experiment 1 show that the phono-translation and semantic distractors have no significant effects on naming latencies. Only the phonological distractor speeded naming latencies. As in previous studies with both bilinguals and monolinguals (e.g., Costa et al., 2003; Hermans et al., 1998; Schriefers, Meyer, & Levelt, 1990), the phonological distractor facilitated naming.

The absence of a phono-translation interference effect seems to indicate that the lexical selection process proceeded in a language-specific way. The semantic distractor also failed to interfere with the target picture. This may be due to the low proficiency level of the participants. If the semantic distractors presented in their L2 are unfamiliar to participants, the expected interference caused by the semantic relationship between the distractor and the picture would fail to occur. This is because the distractor has a very low level of activation in the participant's lexicon and does not enable her/him to access the

related concept and by extension its semantic network. If this hypothesis holds, we should observe a semantic interference effect in the second experiment where the semantic distractor is presented in L1 and is therefore present in the participant's lexicon as part of the semantic network of the target.

3.3 Experiment 2: Bilingual word production in a bilingual setting

In the first experiment we investigated whether there is cross-language competition during bilingual lexical selection in an entirely monolingual experimental setting. Results showed no interference effects, seemingly indicating that lexical selection among moderately proficient TA-French bilinguals is language-specific in a monolingual context. To see whether the lexical selection process functioned similarly or differently in a bilingual experimental setting, we conducted a second experiment where both languages (TA and French) were present in the task. If bilingual lexical selection is a dynamic process influenced by language setting as some theories suggest (e.g., Grosjean, 2013; Hermans et al., 2011; Kroll et al., 2006), then we expect to observe cross-language competition in this experiment.

TA-French bilinguals named pictures in their L2 (French) while ignoring an auditory distractor in their L1 (TA). If there is cross-language competition in a bilingual experimental setting, then longer naming latencies in the phono-translation condition (as compared to the unrelated one) should be observed. Additionally, if cross-language activation extends to the lexeme level, then the phonological facilitation effect reflected in faster naming latencies in the phonological condition should be observed. Finally, lexical competition at the lemma level should result in a semantic interference effect with slower naming latencies in the semantic condition.

3.3.1 Method

3.3.1.1 Participants

Twenty-four TA-French bilinguals students at Université Laval participated in this experiment (age: *M* = 27.2 years old, *SD* = 4.1 years old, range = 21-37 years old; education: *M* = 18.4 years of education, *SD* = 1.7 years). Participants received a monetary compensation for their participation (20 $). All were native speakers of TA and learned

French as a second language at primary school (*M* = 7.2 years old, *SD* = 1.1 years old). Participants' proficiency was assessed in the same way as in Experiment 1. The lexical decision score indicated a moderate level of L2 proficiency for this group of TA-French bilinguals as well (*M* = 0.29 *ΔM*, *SD* = 0.16). As in Experiment 1, the self-ratings indicated a higher level of proficiency (see Table 8).

3.3.1.2 Materials

The same 30 pictures used in Experiment1 (22 for the main experiment and 8 for the practice session) were used in Experiment 2. TA phono-translation (e.g., /ʃabka/ [net] for the picture of a candle [*bougie* in French, /ʃamʕɑ/ in TA]), semantic (e.g., /ʔambu:ba/ [*light bulb*]), phonological (e.g., /bulu:na/ [*screw*]), and unrelated (e.g., /warqa/ [*leaf*]) distractors were constructed for this experiment (the full list of stimuli is in Appendix C). They were matched for subjective frequency, familiarity, and word length in number of phonemes in TA (values for these variables were taken from the TA normative database presented in Chapter 2 of this master's thesis). All distractors were recorded by a native TA speaker who was born and grew up in Tunis, Tunisia.

3.3.1.3 Procedure and data analysis

Design, general procedure and data analysis were the same as in Experiment 1. However, in this experiment, participants were informed from the beginning that the study was on bilingualism and were allowed to speak in their native language.

Table 8: Self-assessed proficiency on a 7-point Likert scale in L2 for participants in Experiment 2

	Experiment 2	
	Mean	SD
Production	5.67	0.92
Comprehension	6.42	0.58
Writing	5.54	0.83
Reading	6.25	0.53

3.3.2 Results

Mispronunciation errors were removed from the analysis of RTs along with responses that were 3 standard deviations above or below each participant's overall mean. This resulted in the exclusion of 5.90% of the total data.

Tables 9 and 10 show the mixed model analysis estimates and tests of fixed effects. Distractor type affected RTs (*p*s < .05). As can be seen in Figure 2, comparisons between the distractor conditions showed that RTs were significantly longer in the phono-translation (*M* = 964.72, *SD* = 285.94) than in the unrelated condition (*M* = 918.16, *SD* = 267.17), RTs in the semantic condition were significantly longer (*M* = 934.23, *SD* = 271.80) than in the unrelated condition and RTs in the phonological condition (*M* = 938.10, *SD* = 284.52) were also longer than in the unrelated condition. SOA also affected performance. In the SOAs comparison, SOA -150 ms was significantly faster (*M* = 895.06, *SD* = 248.78) than the other two and SOA 0 ms was significantly faster (*M* = 952.74, *SD* = 290.17) than SOA 3 (*M* = 969.30, *SD* = 287.89). The interaction distractor type x SOA did not reach significance.

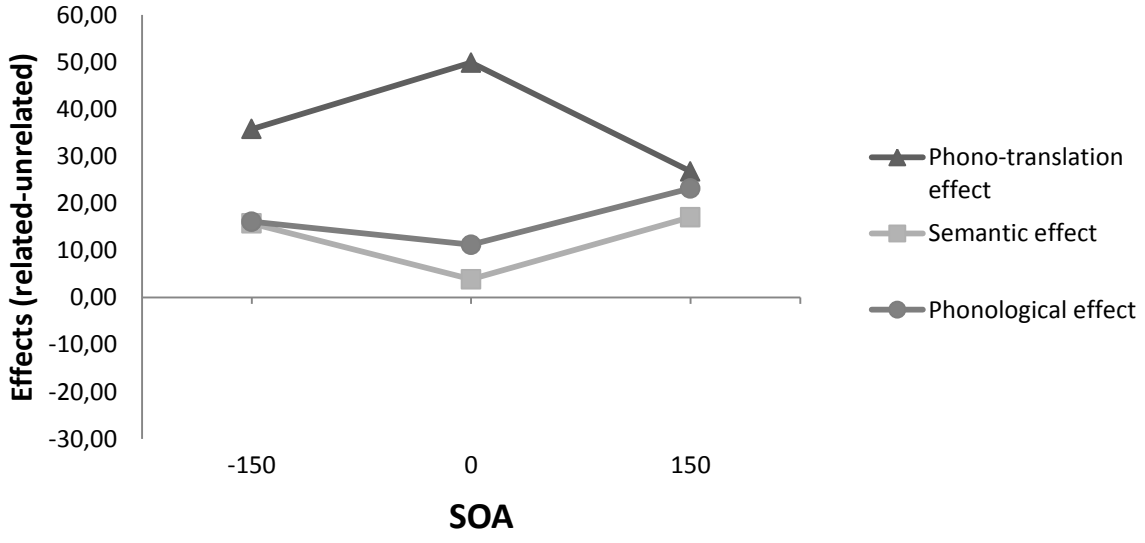

Figure 2. Distractor effects as a function of SOA in Experiment 2

Table 9: Mixed model analysis estimates and tests of fixed effects in Experiment 2

Parameter	F	Numerator df	Demoninator df	Sig.
Intercept	604.06	1	25.29	0.000*
SOA	85.44	2	5752.25	0.000*
Distractor type	7.78	3	5755.75	0.000*
SOA x Distractor type	0.99	6	5752.17	0.425

*$p < .01$.

Table 10: Mixed model analysis estimates and tests of simple effects for distractor and SOA in Experiment 2

Parameter	F	Numerator df	Denominator df	Sig.
Distractor 1 vs 4	33.35	1	3118	0.000*
Distractor 2 vs 4	4.70	1	3118	0.030**
Distractor 3 vs 4	7.35	1	3118	0.007*
SOA 1 vs 2	31.28	1	4172	0.000*
SOA 1 vs 3	40.48	1	4172	0.000*
SOA 2 vs 3	0.57	1	4172	0.025**

Note: Distractor 1, phono-translation distractor; distractor 2, semantic distractor; distractor 3, phonological distractor; distractor 4, unrelated distractor; SOA 1, SOA -150 ms; SOA 2, SOA 0 ms; SOA 3, SOA +150 ms.
*$p < .01$.
**$p < .05$.

3.3.3 Discussion

The results show that the phono-translation, semantic, and phonological L1 distractors all interfered with the picture name in L2. The finding of interference in the semantic condition and more importantly in the phono-translation condition is of particular interest as it suggests the presence of cross-language activation and competition during spoken word processing in a bilingual experimental setting. This finding replicates that of Hermans et al. (1998) who also found a significant phono-translation effect in an experimental setting where both languages were present.

One unexpected finding is that of interference in the phonological condition. In most studies using the PWI task, the phonological distractor has yielded a facilitation effect (Costa et al., 2003, Costa & Caramazza, 1999; Hermans et al., 1998). Only one study by Hoshino and Thierry (2011) has found an interference effect in the phonological condition, which they attributed to the repetition of the picture names as distractors in their

experiment. In the present study, however, there is no such repetition. The interference effect found in the phonological condition in the present study may be due to a variable that has been shown to have powerful effects on picture naming: name agreement (Alario et al., 2004). Although the French name agreement of the pictures in our stimulus set was quite high, name agreement for the same pictures in TA was relatively lower (H = 0.15 in French vs. H = 0.84 in TA). This suggests that the alternative names of the pictures were fewer in French than in TA, with pictures having many possible alternative names in TA. In another study, we have established a 400-picture database providing norms for several psycholinguistic variables including name agreement. A comparison between these TA name agreement norms and the ones in French for the same picture set has revealed that name agreement is much lower in the TA database than in the French one. Thus, it seems that there is a greater variability in the names given to objects in TA than in French –and more possible candidates could be translated into greater within-language lexical competition-. If the competition is stronger because of the presence of so many candidates in L1 for the picture, then facilitation from the phonological distractors will not be sufficient to speed-up access to the picture name in L2 and it will take longer to resolve the competition (resulting in interference). This is particularly likely when the activation level of L1 is heightened by the bilingual context. In contrast, in the monolingual context, resolving the competition is easier because the L1 is strongly inhibited and so the facilitation from the French phonological distractors is successful.

3.4 General discussion

The aim of the present study was to determine whether the lexical selection process is language-specific or nonspecific among moderately proficient TA-French bilinguals. The results of both experiments taken together seem to suggest that the lexical selection process is modulated by the language setting. In a purely monolingual setting (Experiment 1), lexical selection seems to proceed in a language-specific way with lexical competition taking place within the target language only. On the other hand, in a bilingual experimental setting, namely where both languages are present (Experiment 2), lexical selection seems to be cross-linguistic with lexical items from both languages competing for selection. This is in line with Hermans et al.'s (1998) second explanation for their effects and more

importantly, Kroll et al.'s (2006) proposal that bilingual lexical selection is mainly language-nonspecific but may function in a language-specific way in some circumstances and depending on some factors. The authors list among these factors the relative activation levels of the two languages which can be modulated by language context (monolingual or bilingual) of an experimental study.

Surprisingly, Hermans et al. (1998) found a phono-translation interference effect in the monolingual PWI task (naming and distractors in L2), even though, it was not robust, whereas, in Experiment 1 of our study it was far from significance levels ($p = 0.9$). These results are slightly counter-intuitive. Lexical competition is dependent on the activation levels of competitors, and so the higher the activation of the L1, the longer it takes to suppress it to allow selection of the L2 lexical alternative (Green, 1998). For that matter, it is plausible that the higher the proficiency level, the less control mechanisms are recruited during word production in L2 which would result in less cross-language interference (Abutalebi et al., 2008). One would therefore expect cross-language interference to be more important for unbalanced bilinguals with an intermediate level of proficiency in their L2 (which implicates a much higher level of resting activation for L1 than L2) than for highly proficient bilinguals as those studied in Hermans et al. (1998). The data tell us otherwise, since this study's bilinguals showed no evidence whatsoever of cross-language competition in the monolingual experimental setting. In contrast, a reliable phono-translation interference effect was observed in Experiment 2 (i.e., the bilingual experimental setting). This intriguing pattern of results can be accounted for in light of the language mode hypothesis (Grosjean, 2001) and models and theories of language control (Abutalebi & Green, 2007; Green, 1998).

According to the language mode hypothesis (Grosjean, 2001), bilingual speakers are in constant movement on a continuum whose ends are the monolingual and bilingual modes. In a purely monolingual mode the target language is highly activated while the non-target language is at a much lower level of activation. In a bilingual mode, however, both languages are highly activated. In Experiment 1 of the present study, all instructions and stimuli were given exclusively in L2 and participants were clearly instructed not to speak in their native language under any circumstance and were not informed that the research was

related to bilingualism, all of which are factors likely to affect the non-target language activation level (Grosjean, 2013). Therefore, we assume that the L2 was at a much higher activation level than the L1. By contrast, in Experiment 2 both languages were involved and participants were allowed to speak in their native language and were told from the beginning that the research was on bilingualism. Additionally, the experimenter switched willingly between both languages while explaining the nature and instructions of the experiment. Consequently, we assume that the L1 was almost as highly activated as the L2. This is where the mechanisms involved in language control come into play.

Several neuroimaging studies have shown that language control involves the same mechanisms included in domain-general cognitive control (e.g., Abutalebi & Green, 2007; Abutalebi et al., 2008). In a language-switching task with unbalanced, moderately proficient German-Dutch bilinguals, Chritoffels et al. (2007) found evidence for sustained proactive inhibition of L1 (i.e., longer-lasting inhibition of the whole language) which allowed balancing of the activation levels of the two languages. They also suggested that in addition to this sustained global inhibition of the non-target language, a transient control mechanism applies inhibition locally, namely at the level of single items within the language system, as opposed to the inhibition of the activation level of an entire language subsystem. This hypothesis has been advanced by several other studies (e.g., De Groot & Christoffels, 2006; Guo, Liu, Misra, & Kroll, 2011; Wang, Kuhl, Chen, & Dong, 2009). In an fMRI study, Abutalebi et al. (2008) found greater engagement of areas in the neural network responsible for language control, namely the left caudate and left anterior cingulate cortex (ACC) in a bilingual experimental context (switching in picture naming between L1 and L2). They also found extensive activation in the left ACC (responsible for conflict monitoring) during L2 naming (in comparison with L1 naming). The authors concluded that this area might be recruited in the selection of words in the intended language of production.

Based on the abovementioned behavioral and neuroimaging findings, we hypothesize that different cognitive control mechanisms played a role in modulating the relative activation levels of the L1 and L2 in both language settings in our study. In Experiment 1, proactive inhibitory control most likely 'lowered' the activation of the L1

subsystem to allow for production in L2, while the interplay of several control mechanisms, including local conflict monitoring, was required for the selection of the appropriate lexical alternative in Experiment 2. Thus, this difference in activation levels might explain the presence of cross-language interference in Experiment 2 and its absence in Experiment 1. We assume that in Experiment 2 the lexical selection process operated in a language-nonspecific way due to the high activation of both languages and the target language remained as such open to interferences from the non-target language. In Experiment 1 the activation level of L1 was much lower than that of L2 and the inhibition applied to the L1 was sufficient to prevent interference. This also shows that the intention to speak in one language might not be sufficient to modulate the activation levels of both languages.

In conclusion, it seems that there is cross-language competition during lexical selection when the experimental setting involves both languages, as indexed by the phono-translation interference effect found in Experiment 2. When the setting involves the target language exclusively, however, the lexical selection process becomes language-specific. Such findings among moderately-proficient bilinguals are of particular interest to models of bilingual language processing. Some researchers posit that proficiency is a determinant factor of how the lexical selection process operates. Costa et al. (2006) suggested that low-proficient bilinguals' lexical selection is language-nonspecific while among highly-proficient bilinguals it becomes a language-specific process as high proficiency in both languages would prevent cross-language interferences. According to the authors this is why, in a language-switching task, highly-proficient bilinguals show symmetrical switching costs whereas low-proficient bilinguals produce asymmetrical switching costs. However, in their language-switching study, Christoffels et al. (2007) found symmetrical switching costs among moderately proficient bilinguals, which led the authors to conclude that factors such as frequency of use and daily switching may overpower the possible effects language proficiency may have on the functioning of the lexical selection process.

The present study offers new insights into bilingual language processing, as it shows that lexical selection is indeed a dynamic process that may operate as language-specific and nonspecific depending on the circumstances, even among bilinguals who are not highly proficient in their L2. Further studies should be conducted with moderately and low

proficient bilinguals whose languages are lexically distant in order to ascertain the reliability of the present findings.

Chapter 4: Summary and general discussion

This final chapter provides a summary of the aims, methodology, and results of each of the studies reported in this thesis. It is followed by a discussion of the theoretical implications of each study and particularly of the one presented in Chapter 3 for bilingual language modeling and experimental approaches to studying bilingual language processing. We also discuss the limitations of each of the studies. Finally, future research directions and perspectives for which this work paves the way are presented.

4.1 Summary of studies

The general objective of this thesis was to investigate the lexical selection process among bilinguals in relation to variables such as lexical distance between the speaker's languages, the bilingual's relative levels of language proficiency, and language setting. As a first step to the implementation of this investigation, we developed a normative database in TA for four psycholinguistic variables (name agreement, familiarity, subjective frequency, and imageability), a vital tool to proper stimuli selection in our second PWI experiment involving TA distractors.

4.1.1 Chapter 2 - *A standardized set of 400 pictures for Tunisian Arabic: Norms for name agreement, familiarity, subjective frequency, and imageability*

Previous studies have shown that psycholinguistic variables such as name agreement, familiarity, subjective frequency, and imageability are all powerful predictors of naming latencies (e.g., Alario et al., 2004; Barry et al., 1997; Barton et al., 2014; Cuetos et al., 1999). We aimed to develop a psycholinguistic database in TA that would: 1) allow us to control for the effects of those confounding variables in Experiment 2 presented in chapter 3; and 2) would serve in future experimental research involving Arabic-speaking populations. We collected norms for those variables in TA from a sample of 100 young adult (age range: 18-35 years) native speakers of TA. The norms were collected for 400 line-drawings taken from Cycowicz et al. (1997) that include Snodgrass and Vanderwart's (1980) 260 pictures. Comparisons and correlations between these data and the ones from other normative studies in French (Alario & Ferrand, 1999), English (Snodgrass & Vanderwart, 1980), and Spanish (Manoiloff et al., 2010) were conducted. The results

revealed that, as shown in previous studies (e.g., Alario & Ferrand, 1999; Manoiloff et al., 2010), variables like name agreement and familiarity, and even imageability, are culturally-specific. The comparisons also revealed that name agreement is much lower in TA than in other languages. This great variability in the names given to pictures in TA is most probably due to the relative variability that characterizes dialects. These findings confirm the importance to develop and use normative databases specific to the sociolinguistic and cultural contexts of the population or language variety under study.

4.1.2 Chapter 3 – *The bilingual 'hard problem' in spoken word production among Arabic-French bilinguals*

In this study we aimed to investigate the nature of the lexical selection process in two different language settings (monolingual vs. bilingual) among moderately proficient bilinguals whose two languages are lexically distant. We used the PWI task in two experiments where TA-French bilinguals were asked to name pictures in French (their L2) while ignoring auditory distractors presented in L2 (Experiment 1) or L1, namely TA (Experiment 2).

In both experiments, distractor type and SOA significantly affected RTs ($ps < .05$). The interaction distractor x SOA did not reach significance. In Experiment 1, a facilitation effect in the phonological condition was found. No effects were observed in the other distractor conditions. In Experiment 2, interference effects were found in the phono-translation, semantic, and phonological conditions. Thus, in line with previous research, we found cross-language activation among moderately proficient TA-French bilinguals as indexed by the phonological effect in Experiment 2. However, cross-language competition seems to depend on the experimental language setting, as both the semantic and the phono-translation effects were absent from Experiment 1 (i.e., the monolingual experimental setting) but present in Experiment 2 (i.e., the bilingual experimental setting). Taken together, these findings seem to indicate that lexical selection among moderately-proficient TA-French bilinguals is a dynamic process that may function in a language-specific or nonspecific way depending on the language context, as recently hypothesized by some researchers (e.g., Grosjean, 2013; Hermans et al., 2011; Kroll et al., 2006). They also provide support for the idea that the language experimental setting plays a role in

modulating the relative activation of the bilinguals' languages (Grosjean, 2001), even when the task specifies the language of production. Thus, to the best of our knowledge, this study is the first to provide information on the nature of the lexical selection process among moderately proficient bilinguals and brings us a step closer to reconciling conflicting findings from previous studies.

Additionally, the present study makes a number of improvements at the methodological level. We took important methodological measures to ensure as much as possible that our results would be unbiased by some of the pitfalls that arise when studying bilinguals. First, the use of a lexical decision task as a vocabulary test represents a much more reliable way of assessing lexical proficiency than the language history questionnaire widely used in studies on bilingual language processing as the only means of assessing language proficiency. In our study we used both complementary measures which provided us with comprehensive information on the bilingual profile of our sample. Thus we were able to determine our sample's age of L2 acquisition, their language proficiency on the four skills (speaking, writing, listening, reading), as well as their lexical proficiency, all of which are variables known to influence bilingual language processing, individually and in interaction with each other. Additionally, in order to prevent the 'by-participant only' phono-translation effect found in other studies (e.g., Hermans et al., 1998; Costa et al., 2003) we used the mixed effects model (Baayen et al., 2008), a type of analysis that controls for the crossed random effects of participants and items. Another important point is the care taken to establish a highly controlled language experimental setting. In Experiment 1 the native language was never used by neither the experimenter nor the participant, thus successfully creating a fully monolingual setting and in Experiment 2, the experimenter switched constantly between the two languages and participants were allowed to use both languages. Finally, the use of two typologically different languages ensured that the interference effect found in Experiment 2 was unbiased by the possible effects of cross-language similarity (Van Heuven et al., 2011).

4.2 Theoretical Implications and Limitations

In the following section, we will discuss the implications of each of the studies presented in this thesis. The study presented in Chapter 3 and investigating the main subject

of interest in this thesis makes a number of important contributions to research on the field of bilingual language processing in general, and bilingual spoken word production more specifically. We also discuss the limitations of each of the studies presented in Chapters 2 and 3.

4.2.1 Chapter 2 - *A standardized set of 400 pictures for Tunisian Arabic: Norms for name agreement, familiarity, subjective frequency, and imageability*

To the best of our knowledge, this is the first study to provide normative data for the widely used set of 400 pictures created by Cycowicz et al. (1997) for a spoken variety of Arabic. This valuable resource provides the possibility to investigate normal and impaired processing of the Arabic language. This study also has sociolinguistic implications as it reflects the impact of societal bilingualism on a dialect. Indeed, the data presented in the NA task shows the impact the language contact between French and TA has had on the evolution of the latter (e.g., the lexical borrowings and the dominant use of French words to name certain objects).

The results of the NA task along with the comparisons between TA norms and those of other languages show that care should be taken not to mix speakers of different varieties of Arabic in the same sample when studying Arabic language processing. This also represents the most important limitation of this study. Since the presented database is precisely specific to TA, it limits researchers interested in studying spoken Arabic language processing to TA-speaking samples. Similar resources for other varieties of Arabic are therefore needed. Another limitation is the fact that this database contains only norms for concrete names of objects which limits its usefulness to certain paradigms such as picture-naming. Normative data for abstract nouns as well as for verbs would need to be collected to allow for a broader range of experimental investigations involving the Arabic language and its varieties.

4.2.2 Chapter 3 - *The bilingual 'hard problem' in spoken word production among Arabic-French bilinguals*

The findings presented in this study have the potential to improve models of bilingual word production as well as experimental approaches to studying bilinguals. First, the study presents additional evidence for the idea that the way processing takes place

during bilingual language production depends on the interplay of a number of variables including (but not limited to) language proficiency, language context of the study, and the lexical distance between the bilingual's languages. Therefore, models of bilingual word production need to be able to account for bilingual performance in different language contexts and among different types of bilingual populations.

In light of our findings, there is also a need to reconsider the role of the so-called 'language cue' (a feature at the conceptual level that specifies the language of production), a component shared by most models of bilingual word production (e.g., Hermans, 2000; La Heij, 2005; Green, 1998) and that is hypothesized to play a key role in the lexical selection process. Our data suggests that the language cue is not sufficient to modulate and constrain cross-language activation or competition. Therefore, a mechanism that relies solely on language choice, as it is the case in most models of bilingual processing, cannot account for the full scope of bilingual processing in different contexts. For example, in Green's (1998) ICM, lexical selection is solely based on language selection, namely inhibition is applied directly to language tags at the lemma level depending on the target language specified at the conceptual level. However, to assume that language selection takes place that early in speech planning is incompatible with bilingual language production in a bilingual mode (consider, for example, code-switching).

Thus, the present study makes important contributions to future research on bilingual language processing. However, it does have some limitations. First, we could not track the time course of the different effects found in both experiments due to the absence of interaction between the SOA and distractor factors. It is therefore difficult to determine the exact locus of cross-language competition in Experiment 2. Further research will need to be conducted to determine the locus of the phono-translation interference effect in a bilingual context. Hoshino & Thierry (2011) have used ERPs to this very purpose in a monolingual PWI with highly-proficient bilinguals. A similar study could be conducted in order to track cross-language competition in the time-course of spoken word production among moderately proficient bilinguals in a bilingual setting. Another limitation is the high level of inter-participant variability in this study. Bilingual samples are known for their heterogeneity. For example, individual differences in inhibitory control may affect

bilingual word processing (Mercier, Pivneva, & Titone, 2014). The use of a dialect in this study added another level to this inter-participant variability. Thus, further studies among moderately and low proficient bilingual speakers of lexically distant standard languages will be needed to validate the findings presented in this work.

4.3 Future Directions

The work presented here opens new perspectives for research on Arabic language processing (Chapter 2) and bilingual spoken word processing (Chapter 3). The database presented in Chapter 2 offers the opportunity to conduct psycholinguistic research involving the Arabic language. It would be of particular interest if researchers investigated the effects of name agreement, familiarity, subjective frequency, and imageability on performance in different tasks such as picture-naming, word naming and lexical decision.

The study presented in Chapter 3 paves the way to new directions in research on bilingual spoken word production. The key finding in this study is that bilingual lexical processing functions differently depending on variables like language proficiency and experimental setting, among others. Additionally, findings from the language control literature indicate that the control mechanisms involved in bilingual spoken word processing will differ, both at the behavioral and neural levels, depending on factors such as language proficiency (e.g., Costa & Santesteban, 2004), frequency of use or exposure (Christoffels et al., 2007), and language context (Abutalebi et al., 2008). Therefore, we may hypothesize that the same applies to lexical competition in the selection process. Presence, degree and extent of cross-language competition may be modulated by bilingualism-related variables. The next step in research, then, would be to attempt to disentangle the individual effects of these variables as well as the effects of their interaction on lexical activation and competition during bilingual lexical access.

Finally, if there is one thing to retain from our findings and those of countless other studies on bilingual language processing it is that the bilingual is most definitely not two monolinguals in one. Therefore, in order to attain the goal of a comprehensive model of bilingual language processing that accounts for the wide scope of bilingual performance, researchers need to adopt and implement the holistic view of the bilingual as a unique and

specific speaker (Grosjean, 1989) in their experimental approaches as well as their theoretical interpretations and accounts.

4.4 Conclusion

The contributions of this master's thesis are two-fold: First, Chapter 2 makes a significant contribution to the field of research on Arabic language processing by providing a sizeable normative database in TA (one of the spoken varieties of Arabic) that will allow researchers to control for the effects of psycholinguistic variables in experimental studies on the Arabic language. Second, the contribution of the study presented in Chapter 3 to the field of bilingualism rests upon the use of a methodological approach that allowed us to determine the effects of language proficiency and language experimental setting on lexical processing without the bias coming from the presence of cross-language similarity or the presence of the non-target language in the monolingual language setting (Grosjean, 2013). Thus, this thesis further highlights the importance of taking an approach to studying bilingualism that takes into account the dynamic nature of the cognitive and neural mechanisms underlying bilingual language processing. It also provides additional evidence that will serve, we hope, in developing comprehensive theoretical accounts of bilingualism that are specific to its unique nature.

Bibliography

Abutalebi, J., Annoni, J. M., Zimine, I., Pegna, A. J., Seghier, M. I., Lee-Jahnke, H., … Khateb, A. (2008). Language control and lexical competition in bilinguals: An event-related fMRI study. *Cerebral Cortex*, 18(July), 1496–505. doi:10.1093/cercor/bhm182

Abutalebi, J., & Green, D. (2007). Bilingual language production: The neurocognition of language representation and control. *Journal of Neurolinguistics*, *20*(3), 242–75. doi:10.1016/j.jneuroling.2006.10.003

Abutalebi,J., Miozzo,A., & Cappa, S. F. (2000). Do subcortical structures control "language selection" in polyglots? Evidence from pathological language mixing. *Neurocase, 6,* 51–6.

Alario, F. X., & Ferrand, L. (1999). A set of 400 pictures standardized for French: norms for name agreement, image agreement, familiarity, visual complexity, image variability, and age of acquisition. *Behavior Research Methods, Instruments, & Computers, 31*(3), 531–52. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10502875

Alario, F. X., Ferrand, L., Laganaro, M., New, B., Frauenfelder, U. H., & Segui, J. (2004). Predictors of picture naming speed. *Behavior Research Methods, Instruments, & Computers, 36*(1), 140–55. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/15190709

Baayen, R. H., Davidson, D. J., & Bates, D. M. (2008). Mixed-effects modeling with crossed random effects for subjects and items. *Journal of Memory and Language, 59*(4), 390–412. doi:10.1016/j.jml.2007.12.005

Balota, D. a, Pilotti, M., & Cortese, M. J. (2001). Subjective frequency estimates for 2,938 monosyllabic words. *Memory & Cognition, 29*(4), 639–47. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11504012

Barca, L., Burani, C., & Arduino, L. S. (2002). Word naming times and psycholinguistic norms for Italian nouns. *Behavior Research Methods, Instruments, & Computers, 34*(3), 424–34. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12395559

Barry, C., Morrison, C. M., & Ellis, A. W. (1997). Naming the Snodgrass and Vanderwart pictures: Effects of age of acquisition, frequency, and name agreement. *The Quarterly Journal of Experimental Psychology, 50A*(3), 560–85. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/783663595

Barton, J. J. S., Hanif, H. M., Eklinder Björnström, L., & Hills, C. (2014). The word-length effect in reading: A review. *Cognitive Neuropsychology, 31*(5-6), 378–412. doi:10.1080/02643294.2014.895314

Bates, E., D'Amico, S., Jacobsen, T., Székely, A., Andonova, E., Devescovi, A., … Tzeng, O. (2003). Timed picture naming in seven languages. *Psychonomic Bulletin & Review, 10*(2), 344–80. Retrieved from http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3392189&tool=pmcentrez&rendertype=abstract

Baus, C., Strijkers, K., & Costa, A. (2013). When does word frequency influence written production? *Frontiers in Psychology, 4*(963), 1–9. doi:10.3389/fpsyg.2013.00963

Bonin, P., Boyer, B., Méot, A., Fayol, M., & Droit, S. (2004). Psycholinguistic norms for action photographs in French and their relationships with spoken and written latencies. *Behavior Research Methods, Instruments, & Computers, 36*(1), 127–39. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/15190708

Boudelaa, S., & Marslen-Wilson, W. D. (2010). Aralex: a lexical database for modern standard Arabic. *Behavior Research Methods, 42*(2), 481–7. doi:10.3758/BRM.42.2.481

Boudelaa, S., & Marslen-Wilson, W. D. (2013). Morphological structure in the Arabic mental lexicon: Parallels between standard and dialectal Arabic. *Language and Cognitive Processes, 28*(10), 1453–73. doi:10.1080/01690965.2012.719629

Christoffels, I. K., Firk, C., & Schiller, N. O. (2007). Bilingual language control: An event-related brain potential study. *Brain Research, 1147*, 192–208. doi:10.1016/j.brainres.2007.01.137

Colomé, À. (2001). Lexical activation in bilinguals' speech production: Language-specific or language-independent? *Journal of Memory and Language, 45*(4), 721–36. doi:10.1006/jmla.2001.2793

Colomé, A., & Miozzo, M. (2010). Which words are activated during bilingual word production? *Journal of Experimental Psychology: Learning, Memory, and Cognition, 36*(1), 96–109. doi:10.1037/a0017677

Connine, C. M., Mullennix, J., Shernoff, E., & Yelen, J. (1990). Word familiarity and frequency in visual and auditory word recognition. *Journal of Experimental Psychology. Learning, Memory, and Cognition, 16*(6), 1084–96. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/2148581

Cortese, M. J., & Fugett, A. (2004). Imageability ratings for 3,000 monosyllabic words. *Behavior Research Methods, Instruments, & Computers, 36*(3), 384–7. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/15641427

Cortese, M. J., & Schock, J. (2013). Imageability and age of acquisition effects in disyllabic word recognition. *Quarterly Journal of Experimental Psychology, 66*(5), 946–72. doi:10.1080/17470218.2012.722660

Costa, A., Albareda, B., & Santesteban, M. (2008). Assessing the presence of lexical competition across languages: Evidence from the Stroop task. *Bilingualism: Language and Cognition, 11*(1), 121–31. doi:10.1017/S1366728907003252

Costa, A., & Caramazza, A. (1999). Is lexical selection in bilingual speech production language-specific? Further evidence from Spanish–English and English–Spanish bilinguals. *Bilingualism: Language and Cognition, 2*(3), 231–44. Retrieved from http://journals.cambridge.org/abstract_S1366728999000334

Costa, A., Colomé, À., & Caramazza, A. (2000). Lexical access in speech production: The bilingual case. *Psicológica, 21*, 403–37. Retrieved from http://www.wjh.harvard.edu/~caram/PDFs/2000_Costa_Colome_Caramazza.pdf

Costa, A., Colomé, A., Gomez, O., & Sebastin-Galls, N. (2003). Another look at cross-language competition in bilingual speech production: Lexical and phonological factors. *Bilingualism: Language and Cognition, 6*(3), 167–79. doi:10.1017/S1366728903001111

Costa, A., Miozzo, M., & Caramazza, A. (1999). Lexical selection in bilinguals: Do words in the bilingual's two lexicons compete for selection? *Journal of Memory and Language, 41*(3), 365–97. doi:10.1006/jmla.1999.2651

Costa, A., & Santesteban, M. (2004). Lexical access in bilingual speech production: Evidence from language switching in highly proficient bilinguals and L2 learners. *Journal of Memory and Language, 50*(4), 491–511. doi:10.1016/j.jml.2004.02.002

Costa, A., Santesteban, M., & Ivanova, I. (2006). How do highly proficient bilinguals control their lexicalization process? Inhibitory and language-specific selection mechanisms are both functional. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 32*(5), 1057–74. doi:10.1037/0278-7393.32.5.1057

Cuetos, F., Ellis, A. W., & Alvarez, B. (1999). Naming times for the Snodgrass and Vanderwart pictures in Spanish. *Behavior Research Methods, Instruments, & Computers, 31*(4), 650–8. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/10633980

Cycowicz, Y. M., Friedman, D., Rothstein, M., & Snodgrass, J. G. (1997). Picture naming by young children: norms for name agreement, familiarity, and visual complexity. *Journal of Experimental Child Psychology, 65*(2), 171–237. doi:10.1006/jecp.1996.2356

Daoud, M. (2001). The language situation in Tunisia. *Current Issues in Language Planning, 2*(1), 37–41. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/14664200108668018

Davies, R., Rodríguez-Ferreiro, J., Suárez, P., & Cuetos, F. (2013). Lexical and sub-lexical effects on accuracy, reaction time and response duration: impaired and typical word and pseudoword reading in a transparent orthography. *Reading and Writing, 26*(5), 721–38. doi:10.1007/s11145-012-9388-1

De Bot, K. (1992). A bilingual production model : Levelt's "speaking" model adapted. *Applied Linguistics, 13*(1), 1–24.

De Groot, A. M. B., & Christoffels, I. K. (2006). Language control in bilinguals: Monolingual tasks and simultaneous interpreting. *Bilingualism: Language and Cognition, 9*(2), 189–201. doi:10.1017/S1366728906002537

Dell, G. S. (1990). Effects of frequency and vocabulary type on phonological speech errors. *Language and Cognitive Processes, 5*(4), 313–49. doi:10.1080/01690969008407066

Dell'acqua, R., Lotto, L., & Job, R. (2000). Naming times and standardized norms for the Italian PD/DPSS set of 266 pictures: Direct comparisons with American, English, French, and Spanish published databases. *Behavior Research Methods, Instruments, & Computers, 32*(4), 588–615. Retrieved from http://link.springer.com/article/10.3758/BF03200832

Deravi, F. (2009). Language non-specific selection in highly proficient bilinguals. *Acquisition et Interaction En Langue Étrangère, 2,* 131–63.

Desrochers, A., & Thompson, G. L. (2009). Subjective frequency and imageability ratings for 3,600 French nouns. *Behavior Research Methods, 41*(2), 546–57. doi:10.3758/BRM.41.2.546

Dimitropoulou, M., Duñabeitia, J. A., Blitsas, P., & Carreiras, M. (2009). A standardized set of 260 pictures for Modern Greek: norms for name agreement, age of acquisition, and visual complexity. *Behavior Research Methods, 41*(2), 584–9. doi:10.3758/BRM.41.2.584

Ellis, A. W., & Morrison, C. M. (1998). Real age-of-acquisition effects in lexical retrieval. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 24*(2), 515–23. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/9530847

Fabbro, F., Skrap, M., & Aglioti, S. (2000). Pathological switching between languages after frontal lesions in a bilingual patient. *Journal of Neurology, Neurosurgery, and Psychiatry, 68*(5), 650-2

Ferguson, C. A. (1959). Diglossia. *Word, 15*, 325–40. Retrieved from http://scholar.google.com/scholar?hl=en&btnG=Search&q=intitle:Diglossia#0

Ferrand, L., Bonin, P., Méot, A., Augustinova, M., New, B., Pallier, C., & Brysbaert, M. (2008). Age-of-acquisition and subjective frequency estimates for all generally known monosyllabic French words and their relation with other psycholinguistic variables. *Behavior Research Methods, 40*(4), 1049–54. doi:10.3758/BRM.40.4.1049

Finkbeiner, M., Gollan, T. H., & Caramazza, A. (2006). Lexical access in bilingual speakers: What's the (hard) problem? *Bilingualism: Language and Cognition, 9*(2), 153–66. doi:10.1017/S1366728906002501

Forster, K. I., & Forster, J. C. (2003). DMDX: a windows display program with millisecond accuracy. *Behavior Research Methods, Instruments, & Computers, 35*(1), 116–24. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/12723786

Green, D. W. (1998). Mental control of the bilingual lexico-semantic system. *Bilingualism: Language and Cognition, 1*(02), 67–81. doi:10.1017/S1366728998000133

Grosjean, F. (1982). *Life with two languages: An introduction to bilingualism*. Cambridge, Mass: Harvard University Press..

Grosjean, F. (1989). Neurolinguists, beware! The bilingual is not two monolinguals in one person. *Brain and Language, 36*(1), 3–15. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/2465057

Grosjean, F. (2000). Questionnaire pour personnes bilingues. *Unpublished*. Université de Neuchâtel, Neuchâtel, Suisse. 4 pages.

Grosjean, F. (2001). The bilingual's language modes. In J. Nicol (Ed.), *One mind, two languages* (pp. 1–22). Oxford, England: Blackwell publishing Ltd.

Grosjean, F. (2013). Speech production. In *The psycholinguistics of bilingualism* (pp. 55–74). Oxford, England: Wiley-Blackwell.

Guo, T., Liu, H., Misra, M., & Kroll, J. (2011). Local and global inhibition in bilingual word production: fMRI evidence from Chinese–English bilinguals. *NeuroImage, 56*(4), 2300–09. doi:10.1016/j.neuroimage.2011.03.049

Hall, M. L. (2011). Bilingual picture-word studies constrain theories of lexical selection. *Frontiers in Psychology, 2*(December), 1–19. doi:10.3389/fpsyg.2011.00381

Hermans, D. (2000). *Word production in a foreign language.* (Unpublished doctoral dissertation). University of Nijmegen, The Netherlands.

Hermans, D., Bongaerts, T., De Bot, K., & Schreuder, R. (1998). Producing words in a foreign language: Can speakers prevent interference from their first language?

Bilingualism: Language and Cognition, 1(3), 213–29. doi:10.1017/S1366728998000364

Hermans, D., Ormel, E., van Besselaar, R., & van Hell, J. (2011). Lexical activation in bilinguals' speech production is dynamic: How language ambiguous words can affect cross-language activation. *Language and Cognitive Processes, 26*(10), 1687–709. Retrieved from http://www.tandfonline.com/doi/abs/10.1080/01690965.2010.530411

Hirsh, K. W., & Funnell, E. (1995). Those old, familiar things: age of acquisition, familiarity and lexical access in progressive aphasia. *Journal of Neurolinguistics, 9*(1), 23–32. doi:10.1016/0911-6044(95)00003-8

Hoshino, N., & Thierry, G. (2011). Language selection in bilingual word production: electrophysiological evidence for cross-language competition. *Brain Research, 1371*, 100–9. doi:10.1016/j.brainres.2010.11.053

Indefrey, P., & Levelt, W. J. M. (2004). The spatial and temporal signatures of word production components. *Cognition, 92*(1-2), 101–44. doi:10.1016/j.cognition.2002.06.001

Jescheniak, J. D., & Levelt, W. J. M. (1994). Word frequency effects in speech production: Retrieval of syntactic information and of phonological form. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 20*(4), 824–43. doi:10.1037//0278-7393.20.4.824

Khwaileh, T., Body, R., & Herbert, R. (2013). A normative database and determinants of lexical retrieval for 186 Arabic nouns: Effects of psycholinguistic and morpho-syntactic variables on naming latency. *Journal of Psycholinguistic Research*. Advance online publication. doi:10.1007/s10936-013-9277-z

Kremin, H., Perrier, D., Wilde, M., Dordain, M., Le Bayon, A., Gatignol, P., … Arabia, C. (2001). Factors predicting success in picture naming in Alzheimer's disease and primary progressive aphasia. *Brain and Cognition, 46*(1-2), 180–3. Retrieved from http://www.sciencedirect.com/science/article/pii/S0278262600912703

Kroll, J. F., Bobb, S. C., & Wodniecka, Z. (2006). Language selectivity is the exception, not the rule: Arguments against a fixed locus of language selection in bilingual speech. *Bilingualism: Language and Cognition, 9*(02), 119–35. doi:10.1017/S1366728906002483

La Heij, W. (2005). Selection processes in monolingual and bilingual lexical access. In J. F. Kroll & A. M. B. De Groot (Eds.), *Handbook of bilingualism: Psycholinguistic approaches* (pp. 289–307). New York, NY: Oxford university press.

Lemhöfer, K., & Broersma, M. (2012). Introducing LexTALE: A quick and valid Lexical test for advanced learners of English. *Behavior Research Methods, 44*(2), 325–43. doi:10.3758/s13428-011-0146-0

Lepage, J. F., & Corbeil, J. P. (2013). "The evolution of English–French bilingualism in Canada from 1961 to 2011.": Insights on Canadian society, May, Statistics Canada Catalogue no. 75-006-X.

Levelt, W. J. M. (1989). *Speaking: From intention to articulation.* Cambridge: The MIT Press.

Levelt, W. J., Roelofs, A., & Meyer, A. S. (1999). A theory of lexical access in speech production. *Behavioral and Brain Sciences, 22*(1), 1–75. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/11301520

Manoiloff, L., Artstein, M., Canavoso, M. B., Fernández, L., & Segui, J. (2010). Expanded norms for 400 experimental pictures in an Argentinean Spanish-speaking population. *Behavior Research Methods, 42*(2), 452–60. doi:10.3758/BRM.42.2.452

Meara, P. M. (1992). *New approaches to testing vocabulary knowledge.* Unpublished manuscript. Swansea: Centre for Applied Language Studies.

Meara, P. M. (1996). *English Vocabulary Tests: 10 k*. Unpublished manuscript. Swansea: Center for Applied Language Studies.

Mercier, J., Pivneva, I., & Titone, D. (2014). Individual differences in inhibitory control relate to bilingual spoken word processing. *Bilingualism: Language and Cognition, 17*(1), 89–117. doi:10.1017/S1366728913000084

New, B., Pallier, C., Brysbaert, M., & Ferrand, L. (2004). Lexique 2: A new French lexical database. *Behavior Research Methods, Instruments, & Computers, 36*(3), 516–24. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/15641440

Nisi, M., Longoni, A. M., & Snodgrass, J. G. (2000). Misure italiane per l'accordo sul nome, familiarità ed età di acquisizione, per le 260 figure di Snodgrass e Vanderwart (1980) [Italian norms for name agreement, familiarity, and age of acquisition for the S&V (1980) set of pictures].*Giornale Italiano Di Psicologia, 27*(1), 205–18. Retrieved from http://psycnet.apa.org/psycinfo/2001-17858-004

Potvin, K. (2013) *La décision lexicale en contexte d'irrégularité et de pseudo-homophonie* (Unpublished master's essay). Université Laval, Québec, Canada.

Poulisse, N., & Bongaerts, T. (1994). First language use in second language production. *Applied Linguistics, 15*(1), 36–57. doi:10.1093/applin/15.1.36

Primativo, S., Rinaldi, P., O'Brien, S., Paizi, D., Arduino, L. S., & Burani, C. (2013). Bilingual vocabulary size and lexical reading in Italian. *Acta Psychologica, 144*(3), 554–62. doi:10.1016/j.actpsy.2013.09.011

Protopapas, A. (2007). CheckVocal: A program to facilitate checking the accuracy and response time of vocal responses from DMDX. *Behavior Research Methods, 39*(4), 859–62. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/18183901

Roelofs, A. (1992). A spreading-activation theory of lemma retrieval in speaking. *Cognition, 42*, 107–42.

Roelofs, A. (1997). The WEAVER model of word-form encoding in speech production. *Cognition, 64*(3), 249–84. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/9426503

Sanfeliu, M. C., & Fernandez, A. (1996). A set of 254 Snodgrass-Vanderwart pictures standardized for Spanish: Norms for name agreement, image agreement, familiarity, and visual complexity. *Behavior Research Methods, Instruments, & Computers, 28*(4), 537–55. doi:10.3758/BF03200541

Schriefers, H., Meyer, A., & Levelt, W. (1990). Exploring the time course of lexical access in language production: Picture-word interference studies. *Journal of Memory and Language, 102*, 86–102. Retrieved from http://www.sciencedirect.com/science/article/pii/0749596X9090011N

Severens, E., Van Lommel, S., Ratinckx, E., & Hartsuiker, R. J. (2005). Timed picture naming norms for 590 pictures in Dutch. *Acta Psychologica, 119*(2), 159–87. doi:10.1016/j.actpsy.2005.01.002

Snodgrass, J. G., & Vanderwart, M. (1980). A standardized set of 260 pictures: norms for name agreement, image agreement, familiarity, and visual complexity. *Journal of Experimental Psychology: Human Learning and Memory, 6*(2), 174–215. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/7373248

Snodgrass, J. G., & Yuditsky, T. (1996). Naming times for the Snodgrass and Vanderwart pictures. *Behavior Research Methods, Instruments, & Computers, 28*(4), 516–36. Retrieved from http://www.ncbi.nlm.nih.gov/pubmed/23239068

Van Heuven, W. J. B., Conklin, K., Coderre, E. L., Guo, T., & Dijkstra, T. (2011). The influence of cross-language similarity on within- and between-Language Stroop effects in trilinguals. *Frontiers in Psychology, 2*(December), 1–15. doi:10.3389/fpsyg.2011.00374

Vitkovitch, M., & Tyrrell, L. (1995). Sources of disagreement in object naming. *The Quarterly Journal of Experimental Psychology, 48*(4), 822–48. doi:10.1080/14640749508401419

Wang, Y., Kuhl, P. K., Chen, C., & Dong, Q. (2009). Sustained and transient language control in the bilingual brain. *NeuroImage, 47*(1), 414–22. doi:10.1016/j.neuroimage.2008.12.055

Appendix A – Tunisian Arabic norms for name agreement, familiarity, subjective frequency, and imageability

					Name agreement		Familiarity		Imageability		Subjective frequency		Word length	
No.	**Picture**	**TA Intended name**	**TA Modal name**	**Modal name in English**	*H*	*%*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*Ph*	*Syll*
1	airplane	طيّارة	طيّارة	airplane	0,00	100	4,32	0,85	6,28	1,72	5,40	1,44	6	3
2	alligator	تِمسَاح	تِمسَاح	alligator	0,00	100	2,88	1,45	6,54	1,06	3,72	1,54	6	2
3	anchor	لَنْكرةْ	مِرْسات	anchor	1,36	28	2,76	1,39	2,74	2,18	2,21	1,74	6	2
4	ant	نِمَّالهْ	نِمَّالهْ	ant	1,46	72	3,68	1,22	6,24	1,69	4,84	1,55	6	3
5	apple	تُفَّاحهْ	تُفَّاحهْ	apple	0,24	96	4,52	0,71	6,60	1,26	5,68	1,38	6	3
6	arm	ذراع	يِدْ	hand	0,24	96	4,68	0,56	5,56	1,29	3,28	1,62	4	1
7	arrow	سَهم	فْلاَشْ*	arrow	1,20	52	3,20	1,19	5,60	1,66	2,92	1,50	4	1
8	artichoke	قْنَّارِيهْ	قْنَّارِيهْ	artichoke	0,95	56	3,56	1,26	6,32	1,38	4,25	1,42	7	3
9	ashtray	صَنْدرِيَّهْ	صَنْدرِيَّهْ	ashtray	1,17	52	3,92	1,26	5,68	2,17	5,20	1,87	7	2
10	asparagus	سكُومْ	عُودْ	stick	2,75	8	2,20	1,22	2,00	1,98	1,92	1,58	4	1
11	axe	سَاطُور خشَبْ	فَاسْ	axe	1,53	52	3,50	1,10	4,17	2,08	2,21	1,38	9	3
12	baby carriage	كَرُّوسَهْ	كَرُّوسَهْ	baby carriage	1,53	44	3,20	1,15	5,96	1,37	3,67	1,69	6	3
13	ball	كُورَهْ	كُورَهْ	ball	0,24	96	3,68	1,11	6,32	1,18	5,60	1,04	4	2
14	balloon	أمْبُولَهْ	أمْبُولَهْ	balloon	1,24	64	4,08	0,95	5,96	1,79	4,00	1,32	7	3
15	banana	مُوزَهْ	بنَانهْ	banana	0,94	64	4,48	0,65	6,32	1,52	4,68	1,57	4	2
16	barn	مَخْزنْ	دار	house	2,14	52	2,96	1,00	5,56	1,92	3,36	1,70	6	2
17	barrel	بِرميل	بِرميل	barrel	0,00	72	3,48	1,00	6,00	1,50	3,84	1,68	6	2
18	basket	سلّة	سلّة	basket	1,62	32	3,36	1,11	5,04	1,90	3,16	1,68	4	2
19	bear	دِب	دِب	bear	0,00	100	2,84	1,14	5,79	1,82	3,83	1,31	3	1
20	bed	فرش	فرش	bed	0,74	76	4,84	0,37	6,54	0,78	6,12	1,42	4	1
21	bee	نحلهْ	نحلهْ	bee	0,87	68	3,60	1,29	6,38	1,35	4,44	1,19	5	2
22	beetle	خنفوسهْ	خنفوسهْ	beetle	2,42	44	2,88	1,27	5,84	1,55	4,80	1,73	7	3
23	bell	ناقوز	ناقوز	bell	1,14	52	3,00	1,12	5,50	1,84	5,20	1,41	5	2
24	belt	سِبْتَهْ	سِبْتَهْ	belt	0,54	84	4,32	0,75	5,80	1,76	5,36	1,41	5	2
25	bicycle	بسكلات	بسكلات	bicycle	0,24	96	4,25	0,94	6,08	1,68	4,67	1,55	7	2
26	bird	عصفور	عصفور	bird	0,00	100	4,16	0,94	6,48	1,29	5,24	1,59	6	2
27	blouse	سورِيَّهْ	فِيسْتَا	vest	2,68	28	4,36	0,76	6,28	1,67	5,76	1,16	5	2
28	book	كتاب	كتاب	book	0,00	100	4,60	1,00	6,00	1,73	6,04	1,04	4	1
29	bottle	دبُوزَهْ	دبُوزَهْ	bottle	0,00	100	4,42	0,93	6,20	1,32	6,08	1,38	7	3
30	bow	قْرْبِيطَهْ	قْرْبِيطَهْ	bow	1,21	68	3,20	1,26	5,65	1,56	3,46	1,72	7	3
31	bowl	صحفهْ	صحفهْ	bowl	0,48	92	4,16	0,85	6,12	1,69	5,08	1,63	5	2
32	box	حُكَّهْ	صندوق	box	0,55	76	3,68	1,22	5,60	1,91	4,96	1,34	4	2
33	bread	خبز	خبز	bread	1,63	56	4,12	0,88	6,48	1,29	6,52	1,16	4	1
34	broom	مصَلّحَهْ	مصَلّحَهْ	broom	1,51	60	3,76	1,05	6,12	1,42	5,00	1,47	6	2
35	brush	شِيتَّهْ	شِيتَّهْ	brush	1,93	32	3,96	1,23	5,75	1,65	4,32	1,75	4	2
36	bus	كار	كار	bus	0,48	92	4,48	0,99	6,24	1,76	5,52	1,42	3	1
37	butterfly	فرطَطُو	فراشهْ	butterfly	0,79	84	3,75	1,22	5,64	1,82	3,68	1,49	7	3
38	button	فِلَسَهْ	فِلَسَهْ	button	1,71	48	4,04	1,06	5,71	1,68	4,48	1,50	5	2
39	cake	كعبه قَطُو	قْطُو	cake	0,94	76	4,08	1,04	5,52	1,92	4,76	1,27	9	4

40	camel	جمل	جمل	camel	0,00	96	3,28	1,17	6,12	1,59	4,04	1,90	4	1
41	candle	شمعهْ	شمعهْ	candle	0,00	100	4,04	0,93	6,42	0,88	4,08	1,19	5	2
42	cannon	مِدْفَعْ	مِدْفَعْ	cannon	0,72	88	2,33	1,09	5,52	1,71	3,00	1,72	6	2
43	car	كرهبهْ	كرهبهْ	car	0,24	96	4,80	0,50	6,60	1,26	6,60	0,65	6	2
44	carrot	سفنّاريهْ	سفنّارية	carrot	0,56	80	4,00	1,15	6,16	1,70	4,16	1,65	8	3
45	cat	قطّوس	قطّوس	cat	0,00	92	4,08	1,19	6,40	1,41	6,04	1,16	5	2
46	caterpillar	دُودِةْ حرير	دُودَهْ	caterpillar	1,04	72	2,96	1,34	4,50	2,19	2,43	1,44	9	3
47	celery	كلافِسْ	خسّ	lettuce	2,45	12	2,72	1,46	5,17	2,27	3,76	1,76	6	2
48	chain	سِلْسَلَهْ	سِلْسَلَهْ	chain	0,24	96	3,76	1,09	5,58	1,89	4,44	1,71	6	2
49	chair	كرسي	كرسي	chair	0,00	100	4,80	0,65	6,32	1,49	5,92	1,53	5	2
50	cherry	حَبْ ملّوك	تفّاحَه	apple	1,94	32	3,60	1,19	5,16	1,72	3,12	1,51	6	2
51	chicken	دجاجه	دجاجه	chicken	0,40	92	4,04	1,14	6,64	0,95	5,24	1,30	5	2
52	chisel	مِبرْدَه	تُورْنُ فِيسْ*	screwdriver	1,77	24	2,50	1,32	3,76	2,09	2,75	1,73	6	2
53	church	كنِيسِيَّهْ	كنِيسِيَّهْ	church	2,22	36	3,00	1,12	5,92	1,44	3,32	1,63	6	2
54	cigar	سِيڤَارْ	سِيڤَارْ	cigar	2,13	32	3,71	1,12	6,25	1,03	3,92	1,73	5	2
55	cigarette	سِيڤَارُو	سِيڤَارُو	cigarette	0,25	92	4,00	1,22	6,04	1,86	5,84	1,43	6	3
56	clock	مُنْڤَالَهْ	مُنْڤَالَهْ	clock	0,24	96	4,20	1,12	6,25	1,22	5,48	1,64	7	3
57	clothespin	شَكّال	شَكّال	clothespin	1,37	72	4,08	1,00	5,28	2,15	4,72	1,84	5	2
58	cloud	سْحَابْ	سْحَابْ	cloud	0,77	64	3,96	1,23	5,63	2,08	4,70	1,18	4	1
59	clown	مُهَرِّج	كلّونْ*	clown	1,24	68	2,88	1,01	4,56	2,45	2,96	1,62	7	3
60	coat	كَبُّوط	كَبُّوط	coat	1,72	52	4,44	0,58	5,88	1,72	4,76	1,71	5	2
61	comb	مُشْط	خَلّاصْ	comb	1,18	56	4,32	0,95	5,72	1,59	4,20	1,55	4	1
62	corn	قطانيَه	قطانيَه	corn	1,67	48	3,83	1,09	5,64	1,89	4,04	1,46	6	2
63	cow	بَقْرَه	بَقْرَه	cow	0,53	88	3,88	1,20	6,48	1,45	5,12	1,62	5	2
64	crown	تاجْ	تاجْ	crown	0,00	96	2,44	1,00	5,09	2,15	2,96	1,62	3	1
65	cup	فِنْجانْ	فِنْجانْ	cup	1,20	52	4,68	0,69	5,63	1,79	4,96	1,46	6	2
66	deer	غزَالَهْ	غزَالَهْ	deer	0,24	96	2,65	1,19	6,24	1,45	3,92	1,50	5	2
67	desk	بِيرُو	بِيرُو	desk	1,41	68	4,44	0,82	5,96	1,81	5,60	1,38	4	2
68	dog	كَلَب	كَلَب	dog	0,00	96	4,72	0,46	6,56	1,29	5,60	1,50	4	1
69	doll	عرُوسهْ	طَفْلَهْ	girl	2,78	20	4,24	1,01	5,72	1,70	4,68	1,49	5	2
70	donkey	حمار	بهِيمْ	donkey	1,16	68	4,12	1,01	6,32	1,38	4,71	1,65	4	1
71	door	باب	باب	door	0,48	92	4,80	0,58	6,56	1,26	6,48	0,87	3	1
72	doorknob	كُوبَه	كُوبَه	doorknob	2,18	28	3,96	1,16	5,68	2,04	4,29	1,33	4	2
73	dress	رُوبَهْ	رُوبَهْ	dress	0,43	84	4,16	0,90	6,28	1,46	4,80	1,55	4	2
74	dresser	كُمدِينُو	خزَانَهْ	closet	1,89	36	4,16	0,94	5,46	2,02	4,25	1,87	8	4
75	drum	طَبْلَهْ	طَبْلَهْ	drum	1,05	60	3,08	1,14	5,44	2,10	3,24	1,79	4	1
76	duck	بَطَّهْ	بَطَّهْ	duck	0,53	88	3,36	1,32	6,04	1,34	3,92	1,75	4	2
77	eagle	نِسر	نِسر	eagle	1,37	56	3,20	1,35	6,04	1,37	3,36	1,70	4	1
78	ear	وذِنْ	وذِنْ	ear	0,26	88	4,72	0,54	6,13	1,60	5,28	1,37	4	1
79	elephant	فِيلْ	فِيلْ	elephant	0,00	100	3,04	1,37	6,16	1,65	4,17	1,31	3	1
80	envelope	جوَابْ	جوَابْ	envelope	0,90	80	4,00	1,04	5,84	1,65	3,96	1,65	4	1
81	eye	عِينْ	عِينْ	eye	0,00	100	4,68	0,56	6,40	1,44	5,80	1,32	3	1
82	fence	سُورْ	سُورْ	fence	1,97	28	3,04	1,02	5,68	1,84	4,20	1,87	3	1
83	finger	صبُعْ	صبُعْ	finger	0,24	96	4,60	0,65	5,68	1,89	5,00	1,61	4	1
84	fish	حُوتَهْ	حُوتَهْ	fish	0,00	100	4,25	0,94	6,32	1,52	4,92	1,87	4	2
85	flag	عَلَمْ	عَلَمْ	flag	0,41	88	3,56	1,19	6,20	1,35	3,80	1,76	5	2
86	flower	نَوَّارَهْ	وَرْدَهْ	rose	0,80	76	4,16	0,99	6,29	1,16	4,56	1,16	6	3
87	flute	نَايْ	نَايْ	flute	2,73	8	2,63	1,21	4,56	2,38	2,60	1,58	3	1
88	fly	ذبَّانَهْ	ذبَّانَهْ	fly	0,24	96	3,60	1,44	6,00	1,85	5,08	1,68	6	3
89	foot	سَاقْ	سَاقْ	foot	0,40	92	4,80	0,41	5,96	1,76	5,04	1,59	3	1
90	rugby ball	كُورِة رِڤبِي	كُورَه	ball	1,41	48	2,96	1,34	5,20	2,06	2,21	1,14	10	4

91	fork	فَرْفِيتَهْ	فَرْشِيتَهْ	fork	0,00	96	4,36	0,91	5,83	2,01	4,88	1,62	7	3
92	fox	ثعلب	ثعلب	fox	1,14	60	2,60	1,15	5,76	1,76	3,40	1,38	6	2
93	french horn	تُرُمْبِيطَهْ	بُوق	french horn	2,44	20	2,72	1,21	3,58	2,43	2,04	1,63	8	3
94	frog	جَرانَهْ	جَرانَهْ	frog	0,41	88	3,40	1,22	5,92	1,61	3,00	1,32	5	2
95	frying pan	مَقْلَى	قَلَّايَهْ	frying pan	1,75	44	4,36	0,70	5,96	1,79	4,60	1,78	5	2
96	garbage can	زِبْلَا	بُوبَالْ*	garbage can	1,49	36	4,24	0,83	6,44	1,47	5,76	1,61	5	2
97	giraffe	زرافهْ	زرافهْ	giraffe	0,00	100	2,80	1,26	6,44	1,29	3,04	1,51	6	3
98	glass	كاس	كاس	glass	0,00	100	4,79	0,51	6,40	1,32	5,84	1,70	3	1
99	glasses	مرايَاتْ	مرايَاتْ	glasses	1,32	48	4,36	0,99	6,20	1,63	5,24	1,81	6	2
100	glove	قْوَانْدُو	قْوَانْدُوَاتْ	gloves	1,29	56	3,80	1,08	3,92	2,41	2,70	1,69	6	2
101	goat	مَعْزَهْ	مَعْزَهْ	goat	1,02	64	3,44	1,08	6,20	1,66	3,16	1,21	5	2
102	gorilla	غُورِلَا	غُورِلَا	gorilla	1,71	48	2,88	1,30	5,96	1,84	2,96	1,77	6	3
103	grapes	عِنِبْ	عِنِبْ	grapes	0,25	92	4,42	0,72	6,12	1,33	4,32	1,84	4	1
104	grasshopper	جَرادَهْ	جَرادَهْ	grasshopper	1,01	76	3,60	1,08	5,92	1,55	2,84	1,43	5	2
105	guitar	قِيتَارَهْ	قِيتَار*	guitar	1,21	48	4,21	1,10	6,24	1,79	4,68	1,80	6	3
106	gun	فَرْدْ	فَرْدْ	gun	1,24	64	3,04	1,40	5,16	2,29	3,46	1,84	4	1
107	hair	شْعَرْ	شْعَرْ	hair	0,28	80	3,96	1,34	6,48	1,33	5,96	1,31	4	1
108	hammer	مطَرْقَة	مطَرْقَة	hammer	0,00	92	4,00	0,93	6,24	1,54	3,80	1,53	6	2
109	hand	يِدْ	يِدْ	hand	0,00	100	4,83	0,38	6,36	1,55	5,80	1,32	3	1
110	hanger	مِعْلَاقْ	مِعْلَاقْ	hanger	0,89	76	4,28	1,10	5,68	1,65	4,28	1,43	6	2
111	hat	طَرْبُوشَة	شَبُو*	hat	1,36	56	3,80	1,00	6,04	1,65	4,29	1,52	7	3
112	heart	قَلْب	قَلْب	heart	0,40	92	3,56	1,33	5,33	2,01	5,04	1,57	4	1
113	horse	حصَانْ	حصَانْ	horse	0,00	100	3,52	1,39	6,20	1,50	3,80	1,38	4	1
114	house	دَارْ	دَارْ	house	0,74	84	4,04	1,02	6,50	1,32	6,08	1,61	3	1
115	iron	حدِيدْ	حدِيدْ	iron	0,00	100	4,08	0,93	5,20	2,00	4,40	1,66	4	1
116	ironing board	طَاوِلَة حدِيدْ	طَاوِلَة حدِيدْ	ironing board	1,84	44	3,88	0,95	5,75	1,45	3,60	1,68	10	3
117	jacket	فِيسْتَا	فِيسْتَا	jacket	2,79	32	4,20	0,91	5,84	1,70	4,79	1,50	5	2
118	kangaroo	كَنْغُرُو	كَنْغُرُو	kangaroo	0,90	80	2,60	1,00	5,92	1,32	2,40	1,38	7	3
119	kettle	بَرَّادْ	بَرَّادْ	kettle	0,57	72	3,84	1,11	5,68	1,84	4,16	1,80	5	2
120	key	مِفْتَاح	مِفْتَاح	key	0,00	100	4,44	0,87	6,16	1,49	5,16	1,75	6	2
121	kite	طَيَّارَةْ ورَقْ	سَارْفُولَانْ	kite	0,77	44	3,20	1,22	5,58	1,64	2,58	1,50	11	4
122	knife	سِكِّينَهْ	سِكِّينَهْ	knife	0,00	92	4,56	0,65	6,08	1,61	5,56	1,33	6	3
123	ladder	سَلُومْ	سَلُومْ	ladder	0,00	96	4,12	0,88	5,88	1,83	3,92	1,50	5	2
124	lamp	بَجوُرَهْ	قِيُوزَهْ	lamp	0,75	68	4,20	0,82	4,09	2,56	2,92	1,82	6	3
125	leaf	وَرْقَهْ	وَرْقَهْ	leaf	1,37	64	3,88	1,13	6,24	1,27	5,29	1,52	5	2
126	leg	رِجْل	سَاقْ	leg	0,74	84	4,72	0,54	6,04	1,74	4,32	1,63	4	1
127	lemon	قَارِصْ	قَارِصْ	lemon	0,79	80	4,40	0,96	6,38	1,47	5,12	1,48	5	2
128	leopard	فهدْ	نمِر	tiger	1,16	56	3,17	1,40	5,44	1,80	2,68	1,41	4	1
129	cabbage	صَلَاطَهْ	خَسّ	lettuce	1,87	48	3,36	1,44	6,00	1,47	5,60	1,47	5	2
130	light bulb	أَمْبُوبَهْ	أَمْبُوبَهْ	light bulb	1,73	60	4,48	0,96	6,20	1,68	4,24	1,79	7	3
131	light switch	مِفتَاحْ ضَوْ	ضَوْ	light	3,32	12	4,08	0,91	4,43	2,31	2,68	1,70	9	3
132	lion	صيِدْ	صيِدْ	lion	1,00	52	3,00	1,32	6,16	1,57	3,56	1,69	3	1
133	lips	شْفَايِفْ	فُمّ	mouth	0,00	96	4,40	0,76	6,04	1,67	5,24	1,69	6	2
134	lobster	جرَادْ بحَرْ	سرَطَانْ	crab	2,70	16	3,20	1,29	4,56	2,04	2,32	1,68	8	2
135	lock	سُكَارَهْ	كُوبَهْ	doorknob	1,92	40	4,00	1,02	5,40	1,83	3,46	1,86	6	3
136	monkey	قِرْد	قِرْد	monkey	0,00	100	3,12	1,27	6,16	1,49	4,20	1,58	4	1
137	crescent moon	هلَالْ	هلَالْ	crescent moon	0,24	92	4,04	0,93	6,12	1,45	4,04	1,40	4	1

138	motorcycle	مُوطُورْ	مُوطُورْ	motorcycle	0,79	80	4,08	1,18	5,71	1,90	4,80	1,66	5	2
139	mountain	جبَلْ	جبَلْ	mountain	0,00	100	3,44	1,16	6,54	1,02	4,24	1,74	4	1
140	mouse	فَارْ	فَارْ	mouse	0,00	100	3,64	1,15	6,32	1,44	4,08	1,71	3	1
141	mushroom	فُقَّاعْ	شُمْبِنْيُنْ*	mushroom	1,02	56	3,16	1,18	4,68	2,06	2,68	1,55	5	2
142	nail	مُسْمَارْ	مُسْمَارْ	nail	0,27	84	3,84	1,18	6,21	1,41	4,00	1,55	6	2
143	nail	مِبْرِدْ	سِكِّينَهْ	knife	1,88	32	3,32	1,38	4,40	2,29	2,80	1,87	6	2
144	necklace	شَرْكَهْ	شَرْكَهْ	necklace	1,30	60	3,79	1,02	6,00	1,55	5,00	1,32	5	2
145	needle	إِبْرَهْ	إِبْرَهْ	needle	0,50	88	4,04	1,14	6,48	1,33	4,24	1,67	5	2
146	nose	خَشْمْ	خَشْمْ	nose	0,00	96	4,80	0,50	5,96	1,93	5,24	1,56	4	1
147	nut	بُولَونَهْ	بُولَونَهْ	nut	1,43	40	3,44	1,42	5,36	1,96	3,32	1,68	6	3
148	onion	بصَلْ	بصَلْ	onion	0,53	80	4,12	1,05	6,28	1,37	4,76	1,69	4	1
149	orange	بُرْقُدَانْ	بُرْقُدَانْ	orange	1,56	28	3,88	1,09	6,48	1,42	4,64	1,60	8	3
150	ostrich	نَعَامَهْ	نَعَامَهْ	ostrich	0,00	76	2,88	1,24	6,00	1,61	2,79	1,53	5	2
151	owl	بُومَهْ	بُومَهْ	owl	0,25	92	3,24	1,05	6,12	1,64	3,60	1,71	4	2
152	paintbrush	فُوشَهْ	فُوشَهْ	paintbrush	1,80	48	3,88	1,03	5,21	1,91	3,00	1,73	4	2
153	pants	سِرْوَالْ	سِرْوَالْ	pants	0,00	100	4,72	0,54	6,24	1,81	6,32	1,28	6	2
154	peach	مِشْمَاشَهْ	مِشْمَاشَهْ	peach	1,47	36	3,84	1,21	6,16	1,34	4,04	1,40	7	3
155	peacock	طَاوسْ	طَاوسْ	peacock	0,00	92	3,00	1,08	6,16	1,07	2,88	1,48	5	2
156	peanut	كَاكَوِيَّهْ	كَاكَوِيَّهْ	peanut	1,21	36	3,08	1,22	6,20	1,41	4,33	1,34	7	3
157	pear	أَنْزَاصهْ	أَنْزَاصهْ	pear	0,66	84	4,40	1,00	6,12	1,81	4,04	1,81	7	3
158	pen	سْتِيلُو	سْتِيلُو	pen	0,40	92	4,32	0,95	6,24	1,54	5,76	1,59	5	2
159	pencil	قَلَمْ رصَاصْ	قَلَمْ رصَاصْ	pencil	1,52	44	4,44	0,96	6,36	1,44	4,60	1,61	8	2
160	penguin	بَطْرِيقْ	بَطْرِيقْ	penguin	0,74	60	2,96	1,59	5,56	1,94	2,38	1,35	6	2
161	pepper	فِلْفِلْ	فِلْفِلْ	pepper	1,04	48	3,56	1,39	6,16	1,37	4,88	1,56	6	2
162	piano	بِيَانُو	بِيَانُو	piano	0,25	92	3,36	1,04	5,96	1,79	3,72	1,46	5	2
163	pig	حَلُوفْ	خِنْزِيرْ	pig	1,19	64	2,54	0,93	5,52	1,76	3,56	1,78	5	2
164	pineapple	أَنَنَاسْ	أَنَنَاسْ	pineapple	0,53	80	3,36	1,08	6,08	1,26	2,96	1,60	7	3
165	pipe	بِيبَا	بِيبَا	pipe	1,29	28	3,20	1,12	4,28	2,48	2,35	1,53	4	2
166	pitcher	قَمْصَانْ	حَلَّابْ	pitcher	2,21	24	4,12	0,97	4,68	2,15	3,71	1,65	6	2
167	pliers	كَلَّابْ	كَلَّابْ	pliers	0,53	80	3,60	1,08	6,00	1,38	3,16	1,52	5	2
168	pot	كَصَرُولَهْ	كَصَرُونَهْ	pot	1,12	64	4,32	0,85	6,56	1,33	5,04	1,61	8	4
169	potato	بَطَاطَا	بَطَاطَا	potato	0,26	88	3,48	1,58	6,72	1,21	5,56	1,26	6	3
170	pumpkin	قَرَعْ	قَرَعْ	pumpkin	0,43	84	3,48	1,19	5,88	1,69	4,04	1,52	4	1
171	rabbit	أَرْنِبْ	أَرْنِبْ	rabbit	0,25	92	3,64	1,47	6,20	1,47	3,76	1,39	6	2
172	racoon	رَاكُونْ	ثَعْلَبْ	fox	1,95	32	2,44	1,12	3,52	2,31	1,76	0,83	5	2
173	refrigerator	ثَلَّاجَهْ	فرِجِيدَارْ*	refrigerator	0,00	100	4,68	0,63	6,60	1,26	4,96	2,13	6	3
174	rhinoceros	وَحِيد القَرْن	وَحِيد القَرْن	rhinoceros	1,27	52	2,96	1,27	5,58	1,56	2,28	1,37	12	4
175	ring	خَاتِمْ	خَاتِمْ	ring	0,00	92	4,00	1,08	6,44	1,29	5,08	1,47	5	2
176	rocking chair	كُرْسِي دُرْجِيحَهْ	كُرْسِي	chair	1,06	76	3,40	1,29	4,16	1,97	2,38	1,31	12	5
177	rolling pin	قَلْقَالْ	قَلْقَالْ	rolling pin	0,67	56	3,76	1,16	5,79	1,91	2,92	1,58	6	2
178	rooster	سَرْدُوك	سَرْدُوك	rooster	1,04	68	4,12	1,09	6,54	0,98	4,42	1,74	6	2
179	ruler	مَصْطرَا	مَصْطرَا	ruler	0,00	100	4,04	1,14	6,20	1,44	4,20	1,98	6	2
180	sailboat	فلُوكَهْ	بَطُو*	sailboat	2,30	36	3,50	1,14	6,00	1,55	3,83	1,81	5	2
181	salt shaker	مَلَّاحَهْ	مَلَّاحَهْ	salt shaker	1,89	44	3,92	1,08	5,36	2,34	3,75	1,92	6	3
182	sandwic	كَسْكرُو	صنْدوِيتْشْ*	sandwich	1,61	48	3,52	1,29	6,28	1,46	6,04	1,46	7	2

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183	saw	مِنْشَارْ	مِنْشَارْ	saw	0,25	92	3,52	1,19	5,92	1,68	3,44	1,71	6	2
184	scissors	مقَصٌّ	مقَصٌّ	scissors	0,00	96	4,08	1,04	6,40	1,41	4,52	2,06	4	1
185	sea horse	حصَانْ بحَرْ	حصَانْ بحَرْ	sea horse	1,67	28	2,32	1,11	4,68	1,84	1,92	1,15	8	2
186	seal	فُقْمَهْ	فُقْمَهْ	seal	1,24	40	2,80	1,29	5,72	1,40	2,28	0,98	5	2
187	sheep	عَلُوشْ	عَلُوشْ	sheep	0,51	84	4,16	0,90	6,72	1,06	5,08	1,58	5	2
188	shirt	سُورِيَّهْ	سُورِيَّهْ	shirt	1,30	60	4,40	0,82	6,56	1,36	5,32	1,60	5	2
189	shoe	صَبَّاطْ	صَبَّاطْ	shoe	0,00	100	4,48	0,82	6,40	1,15	6,13	1,18	5	2
190	snail	حَلَزُونْ	حَلَزُونْ	snail	0,70	68	3,52	1,16	6,20	1,22	3,88	1,48	7	3
191	snake	حنَشْ	حنَشْ	snake	1,18	72	3,32	1,22	5,60	1,66	3,80	1,50	4	1
192	snowman	رَجُلْ الثَّلْجْ	رَجُلْ الثَّلْجْ	snowman	1,34	56	2,64	1,29	5,33	1,93	2,00	1,19	11	4
193	sock	كَلْصِيطَهْ	كَلْصِيطَهْ	sock	0,24	96	4,32	0,85	6,12	1,64	5,46	1,69	7	3
194	spider	رُتَّيلَهْ	عَنْكَبُوتَ	spider	0,86	60	3,52	1,16	5,83	1,99	2,64	2,22	5	2
195	spinning wheel	مَغْزِلْ	مَكِينَةْ خَيَاطَهْ	spinning wheel	1,77	24	1,80	0,91	4,56	1,94	2,96	2,11	6	2
196	spool of thread	قَنُّوطْ	خِيطْ	spool of thread	2,16	44	3,40	1,41	4,33	2,50	3,55	1,95	5	2
197	spoon	مغَرْفَهْ	مغَرْفَهْ	spoon	0,00	100	4,92	0,28	6,24	1,67	6,32	1,28	6	2
198	squirrel	سِنْجَابْ	سِنْجَابْ	squirrel	0,51	84	2,88	1,24	5,80	1,85	3,16	1,57	6	2
199	star	نِجْمَهْ	نِجْمَهْ	star	0,00	100	3,72	1,14	6,32	0,99	4,16	1,68	5	2
200	stool	طَبُورِيَّهْ	طَبُورَا*	stool	1,37	56	4,32	0,69	6,17	1,24	3,92	2,02	7	3
201	stove	قَازْ	قَازْ	stove	0,64	88	4,60	0,65	5,80	1,32	5,12	1,64	3	1
202	strawberry	فرَاوْلَهْ	فرَازْ*	strawberry	0,77	68	4,12	1,20	6,44	1,12	4,24	1,64	6	2
203	suitcase	فَلِيجَهْ	فَلِيجَهْ	suitcase	1,73	44	4,08	0,81	6,36	1,22	4,19	1,72	6	3
204	sun	شَمْس	شَمْس	sun	0,00	100	4,64	0,81	6,40	1,15	6,24	1,23	4	1
205	swan	وَزَّهْ	بَطَّهْ	duck	1,57	56	3,20	1,15	6,04	1,27	3,40	1,58	4	2
206	sweater	مَرْيُولْ	مَرْيُولْ	sweater	0,64	88	4,68	0,63	6,56	1,00	6,20	1,32	6	2
207	swing	دُرْجِيحَهْ	دُرْجِيحَهْ	swing	0,25	92	3,32	1,14	6,00	1,53	3,36	1,52	7	3
208	table	طَاوْلَهْ	طَاوْلَهْ	table	0,00	100	4,72	0,61	6,75	1,22	5,80	1,47	5	2
209	telephone	تَلِيفُونْ	تَلِيفُونْ	telephone	0,24	96	4,52	0,71	6,72	0,84	6,84	0,47	7	3
210	television	تَلِفَزَهْ	تَلِفَزَهْ	television	0,97	84	4,68	0,63	6,64	1,22	6,12	1,36	6	2
211	tennis racket	رَكَاتْ تَنِيسْ	رَكَاتْ*	racket	2,07	36	3,20	1,22	5,88	1,51	2,68	1,35	11	4
212	thumb	الصبُعْ الكبِيرْ	صبُعْ	finger	0,82	80	4,79	0,41	5,46	1,84	4,04	1,93	12	4
213	tiger	نِمر	نِمر	tiger	0,25	92	3,04	1,27	6,00	1,61	3,00	1,38	4	1
214	toe	صوَابَعْ سَقِّين	صوَابَعْ سَقِّين	toe	1,69	48	4,64	0,57	5,72	1,74	3,80	1,87	7	2
215	tomato	طمَاطِمْ	طمَاطِمْ	tomato	1,42	56	4,48	0,77	6,63	0,97	5,88	1,17	6	2
216	toothbrush	شِيطِةْ سِنِّينْ	برُوسْ أ دُونْ*	toothbrush	2,34	40	4,56	0,77	6,08	1,63	5,56	1,80	10	4
217	top	زَرْبُوطْ	زَرْبُوطْ	top	1,08	68	3,67	1,05	6,33	1,20	3,44	1,66	6	2
218	traffic light	ظَو أَحْمَرْ	فُو*	traffic light	2,28	36	4,17	1,11	6,21	1,10	5,17	1,76	9	3
219	train	تَرَيْنُو	تَرَانْ*	train	1,46	68	4,04	1,06	5,88	1,74	4,71	1,73	5	2
220	tree	شَجَرَهْ	شَجَرَهْ	tree	0,00	96	4,52	0,82	6,52	1,05	5,52	1,64	5	2
221	truck	كَمْيُونْ	كَمْيُونْ	truck	0,25	92	4,13	0,92	6,32	1,18	5,60	1,58	7	3
222	trumpet	بُوقْ	مُزْمَارْ	trumpet	1,75	28	3,04	1,14	5,33	1,69	2,88	1,75	3	1
223	turtle	فَكْرُونَ	فَكْرُونْ	turtle	0,81	72	3,76	1,20	6,24	1,13	3,58	1,72	7	3
224	umbrella	سحَابَهْ	سحَابَهْ	umbrella	0,87	84	4,16	0,94	6,08	1,50	4,40	1,73	5	2
225	vase	مَحْبِسْ	فَازْ*	vase	0,56	80	4,13	1,01	6,04	1,04	3,13	1,25	6	2
226	vest	جِيلِيَّهْ	جَاكَاهْ*	vest	2,25	36	3,40	1,26	6,08	1,67	4,80	1,50	5	2
227	violin	كَمَنْجَهْ	كَمَنْجَهْ	violin	1,64	32	3,44	1,16	6,36	1,29	3,50	1,87	7	3

228	wagon	كَرِّيطَةْ	بَرْوِيطَةْ	wagon	1,96	28	3,08	1,26	5,80	1,35	3,24	1,42	6	3
229	watch	مُنَقَّالَةْ يِدْ	مُنَقَّالَةْ	watch	0,00	100	4,44	0,71	6,56	0,82	4,63	2,04	11	4
230	watering can	مرَشّى	مِرَشّ	watering can	2,06	24	3,56	1,08	4,38	2,04	2,80	1,58	6	3
231	watermelon	دِلَّاعَهْ	دِلَّاغْ	watermelon	1,08	68	4,24	0,83	6,36	1,38	4,84	1,65	5	2
232	well	بِيرْ	بِيرْ	well	0,00	96	3,00	1,15	5,88	1,17	3,52	1,66	3	1
233	wheel	عَجْلَةْ كَرِّيطَةْ	عَجْلَهْ	wheel	0,50	88	3,24	1,27	5,54	1,98	2,38	1,38	12	5
234	whistle	زُفّارهْ	زُفّارهْ	whistle	0,51	84	3,63	1,28	5,92	1,63	3,52	1,76	6	3
235	windmill	طَحُونَهْ	نَعُورَهْ	windmill	1,83	48	2,60	1,19	5,80	1,55	3,20	1,68	6	3
236	window	شِبَّاك	شِبَّاك	window	0,43	84	3,96	1,20	6,60	0,87	5,68	1,68	5	2
237	wine glass	كَاسْ شرَابْ	كَاسْ	glass	0,76	84	4,54	0,88	6,24	1,51	4,32	2,39	7	2
238	wrench	مِفْتَاحْ أَنْڤْلِيزِي	مِفْتَاحْ	wrench	2,08	40	3,72	1,14	3,44	2,06	2,25	1,42	14	5
239	zebra	حِمَارْ وحْشِي	حِمَارْ وحْشِي	zebra	0,51	84	3,12	1,24	6,16	1,11	2,28	1,37	11	4
240	acorn	بُنْدُقْ	بُنْدُقْ	acorn	2,72	8	2,84	1,14	6,42	0,88	4,04	1,49	7	3
241	basin	بَانُو	بَانُو	basin	1,26	72	3,71	0,95	6,20	1,15	4,92	1,73	4	2
242	bench	بَنْكْ	بَنْكْ	bench	1,78	52	4,40	0,65	6,60	0,71	5,32	1,82	4	1
243	binoculars	مِنْظَارْ	مِنْظَارْ	binoculars	1,77	40	3,32	1,31	5,00	1,89	2,56	1,36	6	2
244	bird nest	عُشّ	عُشّ	bird nest	1,02	64	3,12	1,13	5,38	1,84	3,20	1,58	3	1
245	bird hourse	بِيتْ حمَامْ	بِيتْ عَصْفُورْ	bird house	2,78	16	3,08	1,25	5,36	1,55	3,29	1,88	7	2
246	blimp	مِنْطَادْ	مِنْطَادْ	blimp	2,29	40	2,24	1,30	4,80	1,94	2,24	1,36	6	2
247	camera	مُصَوْرَهْ	مُصَوْرَهْ	camera	0,97	72	4,52	0,67	6,33	1,31	5,00	1,73	7	3
248	chest	صَنْدُوقْ	صَنْدُوقْ	chest	0,25	92	3,67	1,01	6,48	1,29	4,39	1,85	6	2
249	chimney	شِمِنِيَّهْ	مِدْخَنَهْ	chimney	2,49	28	3,32	1,18	5,50	2,02	3,16	1,62	7	3
250	closet	خزَانَهْ	خزَانَهْ	closet	1,86	56	4,04	0,93	6,54	0,78	5,32	1,60	5	2
251	colander	كَسْكَاسْ	كَسْكَاسْ	colander	2,55	44	3,92	1,12	6,48	1,19	4,76	1,67	6	2
252	cutting board	قَدُومَهْ	لَوحَهْ	board	1,79	12	3,04	1,49	4,13	2,26	1,72	1,40	6	3
253	dolphin	دُلْفِينْ	دُلْفِينْ	dolphin	1,28	56	3,12	1,09	6,16	1,49	3,00	1,58	6	2
254	dust pan	بَالَهْ	بَالَهْ	dust pan	1,44	56	3,80	1,00	6,29	1,46	3,88	1,51	4	2
255	fan	مَرْوحَهْ	مَرْوحَهْ	fan	0,00	84	3,56	1,16	6,30	1,06	4,33	1,69	6	2
256	faucet	سَبَّالَهْ	سَبَّالَهْ	faucet	0,43	84	4,56	1,04	6,24	1,45	5,75	1,87	6	3
257	feather	رِيشَهْ	رِيشَهْ	feather	0,41	88	3,68	1,52	6,16	1,31	4,21	1,79	4	2
258	fern	شَجْرَهْ	شَجْرَهْ	fern	1,99	24	3,08	1,19	5,74	1,71	4,52	1,78	4	1
259	fishhook	لَمْصُونْ	صُنَّارَهْ	fishhook	2,35	24	3,17	1,20	4,00	2,71	2,12	1,36	6	2
260	fishing rod	صُنَّارَهْ	_	fishing rod	2,00	0	2,67	1,31	5,36	1,93	3,48	1,69	6	3
261	flashlight	بِيلَهْ	ظَوْ	light	2,70	20	3,72	1,14	5,20	2,20	3,92	1,71	4	2
262	globe	كُورَهْ أَرضِيَّهْ	كُورَهْ أَرضِيَّهْ	globe	0,55	76	3,28	1,14	5,52	1,92	3,64	1,78	10	4
263	goggles	مرَايَاتْ عُومَانْ	مَاسْك*	goggles	2,87	12	3,12	1,33	5,04	2,23	2,40	1,19	11	4
264	grill	مَشْوَا	شَوَّايَهْ	grill	2,27	32	3,76	0,93	6,36	1,25	4,36	1,70	5	2
265	groceries	قَطْيَهْ	قَطْيَهْ	groceries	3,11	24	4,12	1,05	5,00	1,98	5,68	1,63	5	2
266	headphones	سَمَّاعَاتْ	كَاسْك*	headphones	1,74	44	3,96	0,98	5,32	1,70	3,67	1,93	7	3
267	hippopotamus	كَرْكَدَنْ	فَرَسْ النَّهْرْ	hippopotamus	1,89	24	2,67	1,13	5,60	1,66	2,84	1,31	8	3
268	hoe	فَاسْ	مِسْحَهْ	hoe	1,63	36	2,76	1,09	6,04	1,37	3,12	1,13	3	1
269	lantern	قَانُوسْ	فَانُوسْ	lantern	2,87	24	3,08	1,02	4,88	2,13	2,21	1,53	4	2

270	logs	حطَبْ	حطَبْ	logs	1,35	68	3,25	1,19	6,17	1,13	3,40	1,68	4	1
271	net	شَبَكَهْ	سَلَّهْ	basket	1,52	48	3,20	1,29	6,00	1,58	4,04	1,93	5	2
272	parrot	بَبَغَّبُو	بَبَغَّبُو	parrot	1,21	68	3,24	1,16	5,28	2,07	3,44	1,66	8	4
273	frame	كوَاتْرُو	كوَاتْرُو	frame	1,46	68	4,28	0,89	5,96	1,43	4,40	1,73	6	2
274	pinball machine	فلِبِرْ	فَرْش	bed	2,35	20	2,60	1,26	2,88	2,05	2,04	1,16	6	2
275	rake	خَرْبَاشْهْ	خَرْبَاشْهْ	rake	2,41	12	3,36	1,15	4,38	2,34	2,44	1,33	7	3
276	rocket	صَارُوخْ	صَارُوخْ	rocket	0,00	96	2,52	1,23	6,28	1,10	4,17	1,46	5	2
277	rope	حبَلْ	حبَلْ	rope	0,24	96	4,00	0,96	6,38	1,21	4,21	1,50	4	1
278	saddle	سَرْجْ	سَرْجْ	saddle	1,51	36	3,08	1,29	4,16	2,23	2,08	1,32	4	1
279	safe	خَزْنَهْ	خَزْنَهْ	safe	1,12	68	3,60	1,08	6,21	1,38	3,48	1,94	5	2
280	scale	مِيزَانْ	مِيزَانْ	scale	0,24	96	3,12	1,09	5,92	1,50	4,08	1,38	5	2
281	syringe	زُرِّيقَهْ	زُرِّيقَهْ	syringe	0,40	92	3,56	1,19	6,33	1,37	4,04	1,49	6	3
282	tambourine	طَار	طَار	tambourine	1,90	40	3,32	1,25	4,36	2,06	3,24	2,11	3	1
283	tire	عَجْلهْ	عَجْلهْ	tire	0,00	100	4,04	1,14	6,00	1,10	4,38	1,74	5	2
284	tractor	تَرَكْتُورْ	تَرَكْتُورْ	tractor	0,96	72	3,28	1,02	6,28	1,57	3,58	1,18	7	2
285	yoyo	يُويُو	يُويُو	yoyo	1,97	20	3,08	1,12	5,79	1,56	4,12	1,56	4	2
286	anteater	آكِل النَّمْل	آكِل النَّمْل	anteater	1,79	12	2,00	1,35	4,00	2,35	1,64	0,91	11	4
287	anvil	سَنْدَانْ	سَنْدَانْ	anvil	1,58	4	2,60	1,15	2,76	1,90	1,46	0,66	6	2
288	arch	قُوسْ	بَابْ	gate	2,02	32	3,68	1,18	5,58	1,59	3,56	2,04	3	1
289	armadillo	أَرْمَدِلُوْ	جَرْبُوعْ	armadillo	1,91	12	1,67	0,96	1,80	1,35	1,44	1,04	9	4
290	avocado	غَلَّهْ	أَفُوكَا*	avocado	2,75	8	2,88	1,24	5,76	1,69	5,46	1,56	4	2
291	bat	خُفَّاشْ	خُفَّاشْ	bat	0,50	88	3,21	1,06	6,04	1,51	3,16	1,55	5	2
292	bird cage	قفَصّ	قفَصّ	bird cage	0,55	76	3,79	1,02	5,88	1,62	4,00	1,85	4	1
293	brain	مُخّ	مُخّ	brain	0,68	80	3,63	0,97	5,36	1,91	5,12	1,39	3	1
294	buffalo	ثَوْرْ وَحْشِي	جَامُوسْ	buffalo	2,72	16	2,32	1,22	4,63	1,88	1,83	1,27	8	3
295	cactus	هِنْدِي	صَبَّارْ	cactus	2,66	24	3,04	1,17	5,84	1,72	4,60	1,76	5	2
296	calipers	مِلْقَاطْ	مِلْقَاطْ	calipers	0,72	32	2,54	1,50	5,48	1,73	4,08	1,78	6	2
297	cheese	جبِنْ	جبِنْ	cheese	0,00	96	3,92	1,26	6,48	1,20	5,56	1,56	4	1
298	cockroach	فَرْزِيتْ	خَنْفُسْ	insect	2,08	40	3,39	1,31	6,54	0,88	3,88	1,24	6	2
299	compass	بَوْصلَهْ	بَوْصلَهْ	compass	1,14	56	3,20	1,22	6,12	1,30	2,44	1,19	6	2
300	crab	سَرَطَانْ	سَرَطَانْ	crab	2,22	40	3,04	1,06	6,08	1,04	3,68	1,67	7	3
301	dinosaur	دَيْنَصُورْ	دَيْنَصُورْ	dinosaur	0,27	84	2,32	1,07	6,25	1,57	3,76	1,83	8	3
302	doghouse	دَار كَلَب	دَار كَلَب	doghouse	2,09	24	3,56	1,08	6,68	0,99	3,24	1,69	7	2
303	dragonfly	وَشْوَاشَهْ	فَرَاشَهْ	butterfly	2,01	44	3,72	0,94	6,44	1,00	5,46	1,56	7	3
304	easel	لَوْحَهْ	صَبُّورَهْ	board	1,77	28	2,88	1,27	5,96	1,31	3,72	1,49	5	2
305	eel	حَنْشَا	حُوتَهْ	fish	1,61	28	2,48	1,42	5,21	2,08	2,88	1,51	5	2
306	fishtail	ذِيلْ حُوتَهْ	ذِيلْ حُوتَهْ	fishtail	2,15	48	3,72	1,24	5,33	1,81	2,96	1,43	7	3
307	funnel	قمَعْ	قمَعْ	funnel	0,30	72	3,58	1,06	5,68	1,38	3,79	1,59	4	1
308	hamburger	هَمْبُرْقِرْ	هَمْبُرْقِرْ*	hamburger	1,62	32	3,20	1,22	5,44	2,06	3,80	1,87	9	3
309	hammock	فَرْش دُرْجِيحَهْ	فَرْش	bed	2,12	16	2,44	1,16	4,04	2,10	2,32	1,35	11	4
310	hyena	ضَبُعْ	ضَبُعْ	hyena	1,66	56	2,92	1,19	5,68	1,70	3,00	1,35	4	1
311	igloo	دَارْ إِسْكِيمُو	دَارْ إِسْكِيمُو	igloo	2,82	20	2,44	1,12	5,04	2,17	1,76	0,93	10	4
312	jellyfish	حُرِيقَهْ	حُرِيقَهْ	jellyfish	1,24	44	2,52	0,92	5,80	1,53	3,71	1,37	6	3
313	koala	كَوَالاْ	كَوَالاْ	koala	1,66	40	2,40	1,26	5,20	2,00	2,68	1,68	6	3

314	ladle	مغَرْفِةْ سوَق	مغَرْفَةْ	spoon	1,65	40	3,76	1,27	5,40	1,80	2,84	1,49	10	3
315	ladybug	خَنْفُوسْ البايْ	كُكُسِنَالْ*	ladybug	1,73	36	3,24	1,27	3,04	2,05	1,68	1,03	12	4
316	lamb	عَلِيلِشْ	عَلُّوشْ	sheep	1,39	64	3,88	1,20	5,60	2,10	3,20	1,61	6	2
317	lipstick	حُمِّيرْ	حُمِّيرْ	lipstick	1,71	56	3,88	1,17	6,28	1,46	4,08	1,87	5	2
318	lizard	وَزْغَهْ	وَزْغَهْ	lizard	2,76	28	2,92	1,14	6,09	1,47	4,00	1,55	5	2
319	llama	لأمَا	جمَلْ	camel	2,13	24	2,28	1,17	3,21	2,52	1,79	1,38	4	2
320	lungs	روَارِي	روَارِي	lungs	0,00	96	3,40	1,08	5,33	1,95	3,40	1,58	5	2
321	moose	أيْل	أيْل	moose	2,22	20	2,08	1,04	3,36	2,14	2,04	1,37	4	1
322	octopus	قَرْنِيطْ	قَرْنِيطْ	octopus	0,59	72	3,00	0,87	6,20	1,38	4,68	1,59	6	2
323	palm tree	نَخْلَهْ	نَخْلَهْ	palm tree	0,00	100	4,12	0,83	6,32	1,44	4,04	1,49	5	2
324	panda	دِبْ بَنْدَا	بَنْدَا	panda	1,41	48	2,38	1,17	4,76	2,01	2,52	1,58	8	3
325	peas	جِلْبَانَهْ	جِلْبَانَهْ	peas	0,51	84	4,08	0,93	6,65	1,11	5,04	1,68	7	3
326	pelican	لَقْلَقْ	لَقْلَقْ	pelican	1,19	48	2,67	1,31	5,87	1,49	3,20	1,91	6	2
327	pyramid	هَرَمْ	هَرَمْ	pyramid	0,74	76	3,08	1,29	5,76	1,81	2,84	1,37	5	2
328	rat	جَرْبُوعْ	فَارْ	mouse	0,25	92	3,40	1,19	6,32	1,28	3,76	1,64	6	2
329	ray	حَبَّارْ	حُوتَهْ	fish	2,95	8	2,36	1,11	5,68	1,55	2,92	1,47	4	1
330	rosebud	بُرْعُمْ وَرْدَهْ	وَرْدَهْ	rose	0,68	80	3,84	0,94	4,72	2,17	2,28	1,40	12	4
331	saxophone	سَكْسُوفُونْ	سَكْسُوفُونْ	saxophone	2,26	20	3,20	1,04	5,24	1,69	2,84	1,43	8	3
332	scorpion	عَقْرَبْ	عَقْرَبْ	scorpion	0,74	84	2,91	0,95	6,36	1,08	3,64	1,60	6	2
333	shark	قِرْش	قِرْش	shark	1,85	44	2,72	1,14	6,00	1,38	3,42	1,38	4	1
334	skeleton	هَيْكَلْ عَظَمِي	سْكُولات*	skeleton	0,99	56	3,20	1,22	5,44	1,76	2,88	1,67	11	4
335	skull	رَاسْ	جُمْجِمَهْ	skull	1,64	64	2,96	1,24	6,21	1,18	5,40	1,73	3	1
336	spider web	شَبْكَةْ عَنْكَبُوتَهْ	شَبْكَةْ عَنْكَبُوتَهْ	spider web	2,09	20	3,64	1,08	6,16	1,52	3,58	1,82	14	5
337	starfish	نِجْمِةْ بحَرْ	نِجْمِةْ بحَرْ	starfish	1,50	36	2,84	1,07	5,33	1,69	2,78	1,62	10	3
338	stethoscope	سَمَّاعَاتْ طِبِّيَّهْ	سَمَّاعَهْ	stethoscope	2,15	28	3,17	0,92	6,25	1,33	2,80	1,68	12	5
339	totem	صَمْبَهْ	صَمْبَهْ	totem	3,02	12	2,28	1,02	5,24	1,56	3,80	1,85	5	2
340	toucan	طُوقَانْ	عَصْفُورْ	bird	2,02	44	2,56	1,12	2,13	1,83	1,44	0,96	5	2
341	turkey	دَنْدُونْ	طَاوِسْ	peacock	2,55	28	2,76	1,16	5,24	2,22	3,04	2,05	6	2
342	vulture	عقَابْ	نِسْرْ	eagle	1,67	32	2,58	1,10	5,36	2,14	2,72	1,57	5	2
343	walrus	فِيلْ البَحر	فُقْمَهْ	seal	1,58	32	2,32	1,18	3,92	2,10	1,79	1,22	10	3
344	washing machine	غَسَّالَهْ	مكِينِةْ صَبُونْ	washing machine	2,07	28	4,36	0,91	6,40	1,04	4,36	1,58	6	3
345	whale	حُوتْ عَنبرْ	بَلَان*	whale	2,55	28	2,24	1,36	3,00	2,19	1,75	0,99	9	3
346	whip	سَوْط	سَوْط	whip	1,45	36	2,20	1,29	3,92	2,41	2,44	1,66	4	1
347	wolf	ذِيبْ	ذِيبْ	wolf	0,68	80	2,88	1,30	6,50	0,78	3,52	1,39	3	1
348	worm	دُودَهْ	دُودَهْ	worm	0,51	84	2,44	1,23	5,80	1,50	3,88	1,62	4	2
349	couch	بَنْك**	بَنْك	couch	1,34	44	4,36	0,86	6,60	0,71	5,32	1,82	4	1
350	zipper	سَلْسَلَهْ**	سَلْسَلَهْ	zipper	1,28	32	3,48	1,50	5,58	1,89	4,44	1,71	6	2
351	baseball glove	قْوَانْدُو**	قْوَانْدُو	gloves	1,58	40	3,08	1,04	3,92	2,41	2,70	1,69	6	2
352	blowfish	حُوتَهْ**	حُوتَهْ	fish	0,30	72	1,76	1,01	6,32	1,52	4,92	1,87	4	2
353	can	حُكَهْ**	حُكَهْ	can	1,46	64	3,64	1,25	5,60	1,91	4,96	1,34	4	2
354	dart	سَهْم**	سَهْم	dart	1,94	36	2,92	1,04	5,60	1,66	2,92	1,50	4	1
355	jar	دَبُّوزَهْ**	دَبُّوزَهْ	jar	1,70	68	3,79	0,88	6,20	1,32	6,08	1,38	7	3
356	accordio	_	بِيَانُو*	piano	1,99	24	2,16	0,99						

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357	baseball bat	_	مَضْرِبْ	baseball bat	1,63	36	3,36	0,99
358	boot	_	بُوطْ*	boot	1,26	76	4,04	0,84
359	cap	_	كَسْكَاتْ*	cap	2,24	28	3,40	1,12
360	football helmet	_	كَاسْكْ*	helmet	0,00	20	2,13	1,19
361	harp	_	قَانُونْ	qanun	1,37	12	2,52	1,05
362	helicopter	_	هَلِيكُوبْتَارْ*	helicopter	1,18	56	3,48	1,29
363	mitten	_	قْوَانْدُوَاتْ	gloves	1,30	60	3,44	1,33
364	plug	_	پرِيزْ*	plug	1,12	64	4,12	0,97
365	pocketbook	_	سَاكْ*	handbag	1,45	72	4,00	1,04
366	record player	_	إِسْطِوَانَهْ	disk	3,12	8	2,48	0,96
367	roller skate	_	بَتَنَات	roller skate	2,41	16	3,12	1,17
368	screw	_	مُسْمَارْ	nail	1,22	44	3,68	0,99
369	screwdriver	_	تُورْنُ فِيسْ*	screwdriver	0,51	84	3,84	1,03
370	skirt	_	جُوبْ*	skirt	0,24	96	4,00	1,04
371	skunk	_	سِنْجَابْ	squirrel	2,28	16	2,24	1,09
372	sled	_	مِزْلاَجْ	sled	2,16	12	2,32	1,41
373	thimble	_	سطْلْ	bucket	2,93	16	2,68	1,03
374	tie	_	كرَافِاَةْ*	tie	0,76	84	4,04	0,86
375	toaster	_	قْرِي پَانْ*	toaster	1,95	8	3,48	1,12
376	ferris wheel	_	مَنَاجْ*	ferris wheel	2,36	16	3,68	1,03
377	fire hydrant	_	_	_	0,00	0	2,46	1,35
378	lawnmower	_	جَزَّارَهْ	lawnmower	2,75	8	3,08	1,19
379	maracas	_	مَضْرِبْ	racket	1,41	12	2,71	1,16
380	microscope	_	مِكْرُوسْكُوبْ*	microscope	1,69	28	2,92	1,15
381	paddle	_	رَكَاتْ*	racket	1,48	36	3,08	1,29
382	parachute	_	مِنْطَادْ	parachute	0,70	76	2,00	1,22
383	platypus	_	بَطْرِيقْ	pinguin	1,92	8	1,68	0,99
384	spatula	_	بَالَهْ	shovel	1,67	48	3,40	1,08
385	showerhead	_	دُوشْ*	shower	1,27	52	4,12	1,13
386	telescope	_	مِنْظَارْ	telescope	2,28	32	2,68	1,22
387	thermos	_	تَرْمُوسْ*	thermos	1,43	40	3,40	1,12
388	tram car	_	مِنْطَادْ	hot-air balloon	2,25	8	2,16	1,11
389	weather vane	_	سَرْدُوكْ	cock	2,28	16	2,28	1,34
390	cymbals	_	عَجْلَهْ	tire	1,87	24	2,50	1,25
391	fishbowl	_	أَكْوَارْيُومْ*	acquarium	2,98	20	3,64	0,95
392	flamingo	_	نعَامَهْ	ostrich	2,31	32	2,60	1,00
393	harmonica	_	يَجُورَهْ	brick	2,06	16	2,76	1,09
394	horseshoe	_	ذكِيرْ	magnet	1,46	24	2,80	1,22
395	pretzel	_	حبَلْ	thread	2,73	24	2,91	1,35
396	propelle	_	مَرْوَحَهْ	fan	0,91	60	2,76	1,27

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397	scoop	_	بَالَهْ	shovel	1,67	28	2,72	1,31
398	squash	_	_	squash	2,00	0	1,80	1,00
399	swordfis h	_	حُوتَهْ	fish	1,66	56	2,38	1,44
400	thermo meter	_	تَرْمُومَاتَرْ*	thermometer	1,72	52	3,16	1,31

The following information is presented in the database : the number assigned to each picture (first column) ; the intended name of each picture transcribed in TA (second column) ; the modal name, namely the most frequent name given by participants to the picture, transcribed in TA (third column) with names given in French identified with an asterisk ; the intended and modal names' English translations (fourth and fifth columns, respectively) ; two name agreement measures : the H statistic and % of participants giving the most common name in TA (sixth and seventh columns, respectively) ; the means and standard deviations for the familiarity, subjective frequency, and imageability of the intended names (subsequent columns) ; word length in number of phonemes and syllables for the intended names (the last two columns).

Note that frequency or imageability ratings are available for only 355 stimuli of the set since the rest (items #365-400) do not have names in TA or are usually referred to with their French name by Tunisian speakers.

** The frequency and imageability values for seven stimuli (#349-355) were the same as those of their homonyms in the database.

Appendix B – Alternative names given in Tunisian Arabic to each picture in the name agreement task

No.	Picture	TA Intended name	TA Modal name	Modal name in English	DK N	DK O	N R	Nondominant names							
3	anchor	لَنْكرةْ	مِرْسات	anchor	12	0	2	مِقذِفْ	سهم	مُخْطافْ					
4	ant	نِمَّالهْ	نِمَّالهْ	ant	0	0	1	فُورْمِ	حَشْرهْ	عنْكُبُوتْ	خنْفُوسهْ	وَشْواشَهْ	نَمُوسهْ		
5	apple	تُفَّاحهْ	تُفَّاحهْ	apple	0	0	0	طمَاطِمْ							
6	arm	ذراع	يِدْ	hand	0	0	0	ذرَاعْ							
7	arrow	سَهم	فْلاَشْ*	arrow	0	0	0	سهم	دِرْكْسيو نْ						
8	artichoke	قْنَّارِيهْ	قْنَّارِيهْ	artichoke	3	1	3	خسّ	كرُمْب	قْرْنِينَهْ					
9	ashtray	صَنْدرِيَّهْ	صَنْدرِيَّهْ	ashtray	1	2	0	صُنْدرِيهْ	كنُونْ						
10	asparagus	سكُومْ	عُودْ	stick	1	13	2	غُصْن	عصا	قطَانيَا	خُظَرَهْ	خَشْبَهْ	غُصْن صغِيرْ		
11	axe	سَاطُور خشَبْ	فَاسْ	axe	1	0	2	قاذُومَهْ	صاطُورْ	مطَرْقَهْ					
12	baby carriage	كَرُّوسَهْ	كَرُّوسَهْ	baby carriage	0	0	1	كَرِّيطهْ	پُوسَاةْ	عَربهْ					
13	ball	كُورَهْ	كُورَهْ	ball	0	0	0	أَمْبولهْ							
14	balloon	أَمْبُولَهْ	أَمْبُولَهْ	balloon	0	0	1	بَلُونَهْ	نُفَّاخهْ						
15	banana	مُوزَهْ	بنَانهْ	banana	0	0	0	مُوزْ							
16	barn	مَخْزِنْ	دار	house	0	0	2	كُوخْ	مَخْزنْ	إسْطَبل	مَعْمِل	مازُونْ	مصنع	دار صغير ة	
17	barrel	برميل	برميل	barrel	2	1	4								
18	basket	سلّة	سلّة	basket	3	0	3	قُفَّهْ	پَنْيا	ساكْ					
20	bed	فرش	فرش	bed	0	1	0	سرير							
21	bee	نحلهْ	نحلهْ	bee	0	0	0	ذبَّانهْ							
22	beetle	خنفوسهْ	خنفوسهْ	beetle	2	0	0	قْرلُو	فرزيت	نمَّالة	صرَّار	دحفوزهْ	ذبَّانهْ	جرانة	و
23	bell	ناقوز	ناقوز	bell	1	0	4	جرس	كاسك						
24	belt	سِبْتَهْ	سِبْتَهْ	belt	0	0	1	سَانتُورْ							
25	bicycle	بسكلات	بسكلات	bicycle	0	0	0	درَّاجه							
26	bird	عصفور	عصفور	bird	0	0	0								
27	blouse	سوريَّهْ	فِسْتَا	vest	1	0	1	جَكَاةْ	شُومِيزْ	سُوريّهْ	بلُوزَنْ	كبّوت	قميص	جِيله	
30	bow	قْرْبِيطَهْ	قْرْبِيطَهْ	bow	0	0	1	پِيِيونْ	نُو	فراشة					
31	bowl	صحفهْ	صحفهْ	bowl	0	0	0	وعاءْ	صحن						
32	box	حُكَّهْ	صندوق	box	0	1	2	باكو	علبة						
33	bread	خبز	خبز	bread	0	1	1	كعكةْ	كايك	جبن	قطُو حلَوِيَّات	ترُنش متع خبز			
34	broom	مصَلَحَهْ	مصَلَحَهْ	broom	1	0	2	شِيةْ	سبركةْ	بالةْ	بروس	مِكنسةْ			
35	brush	شِيتَهْ	شِيتَهْ	brush	1	0	3	مُشْط	بروس	مِكنسهْ	بروس متع شعر				
36	bus	كار	كار	bus	0	0	0	بُوسْ	حفلة						
37	butterfly	فرطَطُو	فراشهْ	butterfly	0	0	0	فرطَطُو	پِيِيونْ						
38	button	فِلَسَهْ	فِلَسَهْ	button	0	1	1	قْفلهْ	بُوتُون	ديسْك	مقفِلْ				
39	cake	كعبه قْطُو	قْطُو	cake	1	0	0	مُورْسُو قْطُو	خبِزَة قْطُو						
40	camel	جمل	جمل	camel	0	0	1								

42	cannon	مِدْفَعْ	مِدْفَعْ	cannon	0	0	0	دبّابة	عجلة	قمبلة						
43	car	كرهبهْ	كرهبهْ	car	0	0	0	سيّارة								
44	carrot	سفنّاريهْ	سفنّارية	carrot	1	0	1	جَزَرْ								
45	cat	قطّوس	قطّوس	cat	0	0	1									
46	caterpillar	دُودِةْ حرير	دُودَهْ	caterpillar	0	0	1	دوده حرير	أم الأربعة وربعين							
47	celery	كلاَفِسْ	خسّ	lettuce	2	7	6	بصْلةْ	معدنوس	كلاَفِزْ	فِنجان	برودو				
48	chain	سِلْسَلَهْ	سِلْسَلَهْ	chain	0	0	0	حديدْ								
50	cherry	حَبْ ملّوك	تفّاحَه	apple	1	2	2	مشماش	سُريز	خوخه	حب ملوك					
51	chicken	دجاجه	دجاجه	chicken	0	0	0	سردوك								
52	chisel	مِبِرْدَه	ثُورْنُ وِيِسْ*	screwdriver	1	13	1	مفك	ركّاضه	مبرد	پانسو					
53	church	كنِيسِيَّهْ	كنِيسِيَّهْ	church	0	0	0	دار	شاتو	جامع	قصر	إِقْليزْ				
54	cigar	سِيڤَارْ	سِيڤَارْ	cigar	0	3	1	قلم	ستيلو	سيڤارو	كرايون	قلم رصاص				
55	cigarette	سِيڤَارُو	سِيڤَارُو	cigarette	1	0	0	سِڤْرَاتْ								
56	clock	مُنْڤَالَهْ	مُنْڤَالَهْ	clock	0	0	0	ساعةْ								
57	clothespin	شَكَّال	شَكَّال	clothespin	1	0	0	ماسك	عصافر	شكّال دبش	شكّال حبل	قارص				
58	cloud	سْحَابْ	سْحَابْ	cloud	0	3	3	غيمةْ	سما							
59	clown	كَلُونْ*	مُهَرِّج	clown	0	0	0	مهرج	شَرْلُو	بهلوان						
60	coat	كَبُّوط	كَبُّوط	coat	1	0	0	مندِيلةْ	طبليَّةْ	شومِيز	بلوزَنْ	معطف				
61	comb	مُشْط	خَلّاصْ	comb	0	0	1	مشط	پَانْيُ							
62	corn	قطّانيَه	قطّانيَه	corn	0	0	2	مسْتورةْ	سِڤّارِيةْ	پُوبْ كورن	عبيِّد					
63	cow	بَقْرَه	بَقْرَه	cow	0	0	0	ثور								
64	crown	تاجْ	تاجْ	crown	1	0	0									
65	cup	فِنْجانْ	فِنْجانْ	cup	0	0	0	كاس	كاس قهوة							
66	deer	غزَالَهْ	غزَالَهْ	deer	0	0	0	رنَةْ								
67	desk	بِيرُو	بِيرُو	desk	0	0	1	طاولة	كوَافُوز	مكتبة	بِرُو					
68	dog	كَلَب	كَلَب	dog	0	0	1									
69	doll	عرُوسهْ	طُفْلَهْ	girl	0	0	1	دميةْ	عروسة	پُوبَا	بَارِبِي	بيبي	طفلة صغيرةْ	بنيّةْ صغيرةْ		
70	donkey	حمار	بهِيمْ	donkey	0	0	0	حمار	حصان							
71	door	باب	باب	door	0	0	0	شبَّاك	خزانةْ							
72	doorknob	كُوبَه	كُوبَه	doorknob	4	1	1	مقبظ	پَوَانْيَا	يد باب	كرسي متع صغار	حلال باب				
73	dress	رُوبَهْ	رُوبَهْ	dress	0	0	1	روب								
74	dresser	كُمِدِينُو	خزَانَهْ	closet	0	5	3	قجرَّات	كمدينو	طابل دُ نوِي	كوَافُوز					
75	drum	طَبْلَهْ	طَبْلَهْ	drum	3	1	1	طمبور	دربوكةْ							
76	duck	بَطّهْ	بَطّهْ	duck	0	0	0	وزّة								
77	eagle	نِسر	نِسر	eagle	0	0	0	صقر	حمامةْ	عصفور						
78	ear	وذِنْ	وذِنْ	ear	0	0	2	مخدّة								
80	envelope	جوَابْ	جوَابْ	envelope	0	0	1	ظرف	ماصُّو	أنڤُلوپ						
82	fence	سُورْ	سُورْ	fence	3	4	1	سياج	لوح	برْيَارْ	حاجز					
83	finger	صبُعْ	صبُعْ	finger	0	0	0	الإبهام								
85	flag	عَلَمْ	عَلَمْ	flag	0	0	1	درابو								
86	flower	نَوَارَهْ	وَرْدَهْ	rose	0	0	0	نوّارة								
87	flute	نَايْ	نَايْ	flute	8	2	4	قلم رصا	مزمار	عود	زمَّارة	فلوة	إبرة			

								ص							
88	fly	ذَبَّانَهْ	ذبَّانَهْ	fly	0	0	0	نمَّالةْ							
89	foot	سَاقْ	سَاقْ	foot	0	0	0	قدم							
90	rugby ball	كُورِة رِقْبِي	كُورَه	ball	1	0	0	كورة رقبي	كورة بايزبول	كورة فوتبول					
91	fork	فَرْشِيتَهْ	فَرْشِيتَهْ	fork	0	0	1								
92	fox	ثعلب	ثعلب	fox	0	0	0	ذيب	إبن آوى						
93	french horn	تُرُمْبِيطَهْ	بُوق	french horn	2	3	0	سكسو فون	مزمار	زمَّارة	ترومپاة	موسيقى			
94	frog	جَرانَهْ	جَرانَهْ	frog	1	0	0	ضِفْدعةْ							
95	frying pan	مَقْلَى	قَلَايَهْ	frying pan	0	0	2	مقلة	طنجرة	كصرونة	پُوال				
96	garbage can	زِبْلَا	بُوبَالْ*	garbage can	1	0	3	زبلة	سطل	سطل زبلة					
99	glasses	مرايَاتْ	مرايَاتْ	glasses	0	0	0	لُونات	نظّارات						
100	glove	قْوَانْدُو	قْوَانْدُوَاتْ	gloves	1	0	0	يد	قْنْ						
101	goat	مَعْزَهْ	مَعْزَهْ	goat	1	0	4	نعجة	جدي	غزالة					
102	gorilla	غُورِلَّا	غُورِلَّا	gorilla	0	0	2	قرد	شمپنزي	قْرِي	غولة				
103	grapes	عِنِبْ	عِنِبْ	grapes	0	0	1	عنقود عنب							
104	grasshopper	جَرادَهْ	جَرادَهْ	grasshopper	0	0	2	قرلّو	صرّار	نمّالة	أنساكة				
105	guitar	قِيتَارَهْ	قِيتَار*	guitar	0	0	3	قْتارة	عود						
106	gun	فَرْدْ	فَرْدْ	gun	0	0	1	مسدّس	مڤرون						
107	hair	شْعَرْ	شْعَرْ	hair	0	2	2	راس							
108	hammer	مطَرْقَة	مطَرْقَة	hammer	2	0	0								
110	hanger	مِعْلَاقْ	مِعْلَاقْ	hanger	1	0	0	سنتر	علاّق						
111	hat	طَرْبُوشَة	شَپُو*	hat	1	0	0	طربوشة	كاسك	مظلّة					
112	heart	قَلْب	قَلْب	heart	0	0	0	كُور							
114	house	دَارْ	دَارْ	house	0	0	1	مِنزِل	كوخ	بيت					
116	ironing board	طَاوِلَة حدِيدْ	طَاوِلَة حدِيدْ	ironing board	0	1	0	طاولة	پلونش	منظدة كوي	فار أ رُيَسّا	حديدة			
117	jacket	پِيسْتَا	پِيسْتَا	jacket	0	0	1	كبُوت	سورية	جَكات	بلوزة	بلَوزَنْ	شوميز	طبليّة	
118	kangaroo	كُنْغُرُو	كُنْغُرُو	kangaroo	0	0	1	سنجاب	كركدن	كنغر					
119	kettle	بَرَّادْ	بَرَّادْ	kettle	0	0	1	زَزْوة	برَّاد تاي						
121	kite	طَيَّارِة ورَقْ	سَارْفُولَانْ	kite	8	0	2	طائرة ورقية	طيَّارة						
122	knife	سِكِّينَهْ	سِكِّينَهْ	knife	0	1	1								
123	ladder	سَلَّومْ	سَلَّومْ	ladder	0	0	1								
124	lamp	قِيُوزَهْ	بَجُورَهْ	lamp	2	1	1	فاز	أبجُور						
125	leaf	وَرْقَهْ	وَرْقَهْ	leaf	0	0	3	عنب	خروع	ورقة عنب	ورقة شجرة				
126	leg	رِجْل	سَاقْ	leg	0	0	0	رجل	ركبة	جومب					
127	lemon	قَارِصْ	قَارِصْ	lemon	0	1	0	لِمون	كعبة قارص						
128	leopard	فهدْ	نِمر	tiger	0	0	2	فهد	ذيب						
129	cabbage	صَلَاطَهْ	خَسّ	lettuce	0	3	1	كرمب	لاتُو	راس بروكلو	كلافز	نبته			
130	light bulb	أمْبُوبَهْ	أمْبُوبَهْ	light bulb	0	0	0	ضوّ	لامبا	لامپ	پلانة	أمبولة			
131	light switch	ضَوْ مِفتَاحْ	ضَوْ	light	4	1	4	زرّ	باب	مفتاح	أنتَرپتُور	برِيز	دِسترِبُ تارْ	نقوز	
132	lion	صِيدْ	صِيدْ	lion	0	0	0	أسد							
133	lips	شْفَايِفْ	فُمّ	mouth	0	0	1								
134	lobster	جرَادْ بحَرْ	سرَطَانْ	crab	1	1	5	سكرپيو	لانقوسة	كراب	عقرب	حوته	سرطا		

								ن					ن البحر
135	lock	سُكَارَهْ	كُوبَهْ	doorknob	2	0	3	كدنآ	شُرلية	بلوكوس	جرّاية		
137	crescent moon	هلَالْ	هلَالْ	crescent moon	0	0	0	قمرة					
138	motorcycle	مُوطُورْ	مُوطُورْ	motorcycle	0	0	1	موبلاة	موتور				
141	mushroom	قُفَاعْ	شُمْبِنْيُنْ*	mushroom	3	0	2	فوقاع	فطر				
142	nail	مُسْمَارْ	مُسْمَارْ	nail	0	1	2	فِيس					
143	nail	مِبْرِدْ	سِكِّينَهْ	knife	1	0	3	لِيم	مبرد	موس	نرِج		
144	necklace	شُرْكَهْ	شُرْكَهْ	necklace	0	1	1	صلصال	كلّيا	شان			
145	needle	إِبْرَهْ	إِبْرَهْ	needle	0	0	1	ريشة	عصا				
146	nose	خَشْمْ	خَشْمْ	nose	0	0	1						
147	nut	بُولُونَهْ	بُولُونَهْ	nut	0	10	1	حياصة	فِيس	روندِيلة	باريمة		
148	onion	بصَلْ	بصَلْ	onion	0	2	1	راس بصل	كرمُوسة				
149	orange	بُرْقْدَانهْ	بُرْقْدَانهْ	orange	0	4	5	رمّانة	لَيمونة	برتقال			
150	ostrich	نعَامَهْ	نعَامَهْ	ostrich	3	0	3						
151	owl	بُومَهْ	بُومَهْ	owl	0	0	1	إبُو					
152	paintbrush	فُوشَهْ	فُوشَهْ	paintbrush	2	0	2	بِنْسُو	شيطة حبر صيني	بِلُوم	ريشة		
154	peach	مِشْمَاشَهْ	مِشْمَاشَهْ	peach	1	3	1	خوخة	لَيمة	رمّان			
155	peacock	طَاوِسْ	طَاوِسْ	peacock	1	0	1						
156	peanut	كَاكَوِيَّهْ	كَاكَوِيَّهْ	peanut	0	9	2	أكجو	جوز	رمّان			
157	pear	أَنْزَاصهْ	أَنْزَاصهْ	pear	0	0	0	سفرجلة	إجَّاص				
158	pen	ستِيلُو	ستِيلُو	pen	0	0	0	قلم					
159	pencil	قَلْمْ رصَاصْ	قَلْمْ رصَاصْ	pencil	0	0	0	قلم	كرايون	ستيلو			
160	penguin	بَطْرِيقْ	بَطْرِيقْ	penguin	3	0	2	پنڤوان					
161	pepper	فِلْفِلْ	فِلْفِلْ	pepper	2	6	1	قرع	طماطم	سفرجل			
162	piano	پِيَانُو	پِيَانُو	piano	0	0	1	قيتارة					
163	pig	حَلُوفْ	خِنْزِيرْ	pig	0	0	2	حلُوف	كوشن	پِيڤْ			
164	pineapple	أَنَنَاسْ	أَنَنَاسْ	pineapple	1	0	1	كيوي	جوز الهند				
165	pipe	پِيپَا	پِيپَا	pipe	7	0	3	پيپا	پاي				
166	pitcher	قَمْصَانْ	حَلَّابْ	pitcher	2	0	4	قمصان	قمصان متع ما	إبريق	باز	كراف	
167	pliers	كُلَّابْ	كُلَّابْ	pliers	3	0	0	مفتاح	مِفكّ براغي				
168	pot	كَصَرُونَهْ	كَصَرُونَهْ	pot	1	1	2	قصعة	طنجرة	كَسُرُول			
169	potato	بَطَاطَا	بَطَاطَا	potato	0	2	0	حجرة					
170	pumpkin	قُرَعْ	قُرَعْ	pumpkin	1	0	1	بطّيخة					
171	rabbit	أَرْنِبْ	أَرْنِبْ	rabbit	0	0	0	فار					
172	racoon	رَاكُونْ	ثَعْلِبْ	fox	7	1	2	فهد	فنك	سنجاب	ذيب	حيوان	
174	rhinoceros	وَحِيدِ القَرْن	وَحِيدِ القَرْن	rhinoceros	3	1	0	كركدن	فرس النهر				
175	ring	خَاتِمْ	خَاتِمْ	ring	2	0	0						
176	rocking chair	كُرْسِي دُرْجِيحَهْ	كُرْسِي	chair	1	0	0	كرسي متحرّك	كرسي هزّاز	كرسي يدّرجح			
177	rolling	قَلْقَالْ	قَلْقَالْ	rolling	5	1	3	عصا	قلاّي				

	pin			pin				نخبزو بيها					
178	rooster	سَرْدُوك	سَرْدُوك	rooster	0	0	1	دجاجة	ديك				
180	sailboat	فلُوكَهْ	بَطُو*	sailboat	0	0	1	فلوكة	قارب	زورق	بابور	سفينة	مركب
181	salt shaker	مَلّاحَهْ	مَلّاحَهْ	salt shaker	2	0	3	دبوزة ملح	ملح	ماملحة	رشّة ملح	حكّة	
182	sandwich	كَسْكرُوتْ	صنْدوِيتْشْ*	sandwich	0	1	1	كسكروت	فرُوماج	تُوسْتة	پيتزا		
183	saw	مِنْشَارْ	مِنْشَارْ	saw	0	0	1	فوشة					
184	scissors	مقَصّ	مقَصّ	scissors	0	0	1						
185	sea horse	حصَانْ بحَرْ	حصَانْ بحَرْ	sea horse	11	0	3	فرس البحر	عجل البحر	كلب البحر	تنّين البحر		
186	seal	فُقْمَهْ	فُقْمَهْ	seal	1	0	4	كلب الما	كلب البحر				
187	sheep	عَلُوشْ	عَلُوشْ	sheep	0	0	2	كبش	خروف				
188	shirt	سُورِيَّهْ	سُورِيَّهْ	shirt	1	0	1	شوميز	بلوزة	پولو			
190	snail	حَلَزُونْ	حَلَزُونْ	snail	0	0	3	بَبُوشة					
191	snake	حنَشْ	حنَشْ	snake	0	0	0	لفعة	ثعبان	سرپون			
192	snowman	رَجُلْ الثّلّجْ	رَجُلْ الثّلّجْ	snowman	4	0	1	بون أوم دُناج	ثلج	عروس الثلج	تمثال ثلجي		
193	sock	كَلَصِيطَهْ	كَلَصِيطَهْ	sock	0	0	0	ساق					
194	spider	عَنْكبُوتَ	رُتَيلَهْ	spider	0	0	1	رُتيلة					
195	spinning wheel	مَغْزِلْ	مَكِينَهْ خَيَاطَهْ	spinning wheel	8	0	5	آلة خياطة	آلة تصوير	مغزل	منسج		
196	spool of thread	قَنّوطْ	خِيطْ	spool of thread	2	0	0	كبة خيط	قنوط متع خيط	بكرة	قنوط	بُبِيناْ	خيط صنارة
198	squirrel	سِنْجَابْ	سِنْجَابْ	squirrel	1	0	1	فار	أكُورُوي				
200	stool	طَبُورَا*	طَبُورِيَّهْ	stool	0	0	0	كرسي	كنبا	طاولة			
201	stove	ڤَازْ	ڤَازْ	stove	0	0	0	ماشين ألَبا	غسّالة شون				
202	strawberry	فرَاوْلَهْ	فرَازْ*	strawberry	0	0	0	فراولة					
203	suitcase	فَلِيجَهْ	فَلِيجَهْ	suitcase	0	0	1	كرطابة	بليز	صاك	پُورة مونا		
205	swan	وَزّهْ	بَطّهْ	duck	0	0	0	وزة	بجعة	جرمانة			
206	sweater	مَرْيُولْ	مَرْيُولْ	sweater	0	0	0	تريكو	پول				
207	swing	دُرْجِيحَهْ	دُرْجِيحَهْ	swing	0	0	1	بَلونسوار					
209	telephone	تَلِيفونْ	تَلِيفونْ	telephone	0	0	0	تلفون فيكس					
210	television	تَلِفْزَهْ	تَلِفْزَهْ	television	0	0	0	رديو	ماشين ألَبا	تَلا			
211	tennis racket	رَكَاتْ تَنِيسْ	رَكَاتْ*	racket	1	0	2	مضرب	ركاة تنيس	مضرب تنيس	ڤولف	تنيس	
212	thumb	الصبُعْ الكبِيرْ	صبُعْ	finger	0	0	0	صبع لكبير	إبهام				
213	tiger	نِمر	نِمر	tiger	0	0	0	فهد					
214	toe	صوَابَعْ سَفِّين	صوَابَعْ سَفِّين	toe	0	0	1	صوابع	ساق	صبع			
215	tomato	طمَاطِمْ	طمَاطِمْ	tomato	0	2	1	قرعة	يقطينه	كاكي	ثُماة		
216	toothbrush	شِيطِةْ سِنِّينْ	برُوسْ أ دُونْ*	toothbrush	0	0	0	شيطة سنين	فرشاة أسنان	فرشيطه	شيطة	دنتيفريس	بروص
217	top	زَرْبُوطْ	زَرْبُوطْ	top	1	1	1	دوامة	تپي		ڤجرا		
218	traffic	ظَو أحْمَرْ	فُو*	traffic	1	0	2	ضو	إشارة	أضواء	فو روج	ضو	ترمو

	light			light				مرور	المرور	الطريق			س		
219	train	تَرَيْنُو	تَرَانْ*	train	0	0	0	ترينو	مترو	قطار					
220	tree	شَجْرَهْ	شَجْرَهْ	tree	0	0	0								
221	truck	كَمْيُونْ	كَمْيُونْ	truck	0	0	0	شاحنة							
222	trumpet	بُوقْ	مُزْمَارْ	trumpet	4	1	3	زمارة	بوق	ترمپاة					
223	turtle	فَكْرُونْ	فَكْرُونْ	turtle	0	0	0	سلحفاة							
224	umbrell a	سحَابَهْ	سحَابَهْ	umbrell a	0	0	0	مظلة	پراپلوي	مطرية					
225	vase	مَحْبِسْ	فَازْ*	vase	1	0	1	مزهرية							
226	vest	جِيلِّيَهْ	جَاكَاةْ*	vest	3	0	3	دودون	سورية	شميز	فرملة	باسة	جيلا		
227	violin	كَمَنْجَهْ	كَمَنْجَهْ	violin	2	0	0	ڤيتارة	ڤيولون	عود					
228	wagon	بَرْوِيطَهْ	بَرْوِيطَهْ	wagon	9	0	1	كريطة	جرارة	عربة	كروسة				
230	waterin g can	مرَشّْهْ	مِرَشّْ	watering can	5	0	5	رشاش ما	إبريق	براد	قمصان ما	محبس			
231	waterm elon	دِلّاعَهْ	دِلّاعْ	waterm elon	0	0	0	برج دلاع	بطيخ						
232	well	بِيرْ	بِيرْ	well	0	0	1								
233	wheel	عَجْلَهْ كَرِّيطَهْ	عَجْلَهْ	wheel	0	0	1	عجلة كريطة	عجلة لوح						
234	whistle	زْفَارهْ	زْفَارهْ	whistle	0	0	2	زمارة	مكينة متع طباعة						
235	windmil l	طَاحُونَهْ	نَاعُورَهْ	windmill	1	0	2	طحونة	مولان	مروحة	لوحة				
236	window	شْبَّاك	شْبَّاك	window	0	1	0	باب							
237	wine glass	كَاسْ شرَابْ	كَاسْ	glass	0	0	0	كاس بلار	كوپ						
238	wrench	مِفْتَاحْ أَنْڤْلِيزِي	مِفْتَاحْ	wrench	6	0	0	كلاب	مفك براغي	مفك	كلاّ مُلاّ	تورن ڤيس	مكلاب		
239	zebra	حِمَارْ وحْشِي	حِمَارْ وحْشِي	zebra	0	0	0	بهيم	زابر						
240	acorn	بُوفْرِيوَا	بُنْدُقْ	acorn	10	1	3	بُنآ	بفريوة	زوز	طربوشة	شپو	خضرة		
241	basin	بَانُو	بَانُو	basin	1	0	1	پُو	بول	صحفة	قلاب	صندو ق			
242	bench	بَنْكْ	بَنْكْ	bench	0	0	0	كرسي بلوح	كرسي	مقعد	بون				
243	binocul ars	مِنْظَارْ	مِنْظَارْ	binocula rs	2	0	5	مكبرة	لوپُ	ميكروسكو پ	مصورة				
244	bird nest	عُشّ	عُشّ	bird nest	2	0	1	عش عصافر	عش حمام						
245	bird house	بِيتْ حمَامْ	بِيتْ عَصْفُورْ	bird house	7	0	5	بيت كلب	دار عصفور	منڤالة	نيش	عش	صندو ق	باز	
246	blimp	مِنْطَادْ	مِنْطَادْ	blimp	1	3	2	صاروخ	طيارة	قرع أخضر	غواصة	قرع	بالون	طيارة حربية	
247	camera	مُصَوْرَهْ	مُصَوْرَهْ	camera	1	0	1	كامرا	أپراي فوتو						
248	chest	صَنْدُوقْ	صَنْدُوقْ	chest	0	0	1	كفرآ							
249	chimne y	شِمِنِيَّهْ	مِدْخَنَهْ	chimney	1	0	3	مدفنة	شيمينية	شاروق	معمل	دخانة	شميناَ		
250	closet	خزَانَهْ	خزَانَهْ	closet	0	0	0	باب	خزانة دبش	ڤلص	ڤارد روب	پلاكار			
251	coland er	كَسْكَاسْ	كَسْكَاسْ	colande r	0	1	1	صفاية	صحفة	كسرونة	مصفاّة	طنجرة	مقفول	عصار ة	
252	cutting board	قَادُومَهْ	لَوحَهْ	board	5	7	7	قطاعة لحم	بالا	پلاة					
253	dolphin	دُلْفِينْ	دُلْفِينْ	dolphin	0	0	0	حوته	دوفان						
254	dust pan	بَالَهْ	بَالَهْ	dust pan	2	0	3	پلاة	مسحة	مجرفة	پل	مكنسة			
255	fan	مَرُوحَهْ	مَرُوحَهْ	fan	2	0	2								

256	faucet	سَبَّالَهْ	سَبَّالَهْ	faucet	1	0	1	شيشمة							
257	feather	رِيشَهْ	رِيشَهْ	feather	0	0	1	ورقة							
258	fern	حْشِيشْ	شَجْرَهْ	fern	1	8	3	نخلة	حشيش	نبته	عشب				
259	fishhook	لْمْصُونْ	صُنَّارَهْ	fishhook	2	6	2	هامسون	مرساة	مساك	شاس	منجل	مخطاف		
260	fishing rod	صُنَّارَهْ	_	fishing rod	4	15	2	كرسي	خيط	موتور					
261	flashlight	بِيلَهْ	ظَوْ	light	3	0	4	مصباح	لومپُ تورش	لامباتريك	كشاف	لومپُ باتري	لومپُ	تظوي	
262	globe	كُورَهْ أَرضِيَّهْ	كُورَهْ أَرضِيَّهْ	globe	2	0	1	كورة العلم	كورة						
263	goggles	مرَايَاتْ عُومَانْ	مَاسْك*	goggles	2	4	4	منظار	مرايات	مرايات بحر	كاسك	جُمال	لونات	نظارات سباحة	
264	grill	مَشْوَا	شَوَّايَهْ	grill	1	0	0	مشوا	كانون	بربكيو	مقود	ڤاز			
265	groceries	قَظَيَهْ	قَظَيَهْ	groceries	1	2	2	صاك قظية	صاك قظية	زبلة	كيس	قفة	شكارة	پوبال	
266	headphones	سَمَّاعَاتْ	كَاسْك*	headphones	1	0	3	صاك قظية	أكوتور	كية	ميك				
267	hippopotamus	كَرْكَدَنْ	فَرَسْ النَّهْرْ	hippopotamus	2	2	3	خنزير	هيپُوپو تام	كركدن	وحيد القرن				
268	hoe	فَاسْ	مِسْحَهْ	hoe	9	0	2	رفش	مجرفة	فاس	مشط				
269	lantern	ڤَازَهْ	فَانُوسْ	lantern	4	0	1	مصباح	قنديل	فنار	ڤازة	ضو	ساعة رملية	مكسور	
270	logs	حطَبْ	حطَبْ	logs	0	0	0	خشب	لوح	طابونة					
271	net	شَبْكَهْ	سَلَّهْ	basket	1	1	1	شبكة	فيلاّ	كاركارا					
272	parrot	بَبَغَيُّو	بَبَغَيُّو	parrot	0	0	2	صقر	غراب	پُيروكا	عصفور				
273	frame	كوَاثْرُو	كوَاثْرُو	frame	0	0	0	تصويرة	تلفزة	طابلو	كادر				
274	pinball machine	فِلِيرْ	فَرْش	bed	3	5	2	فليپر	بيارد	سرير	لوعبا	جو			
275	rake	خَرْبَاشْهْ	خَرْبَاشْهْ	rake	5	2	5	مسحة	مشط	مجرافة	راتام	فرش			
276	rocket	صَارُوخْ	صَارُوخْ	rocket	0	0	1								
277	rope	حبَلْ	حبَلْ	rope	0	0	0	خيط							
278	saddle	سَرْجْ	سَرْجْ	saddle	7	1	4	سرج الحصان	مزمار	سرام	بردعة				
279	safe	خَزْنَهْ	خَزْنَهْ	safe	1	0	1	كوفر	خزنة متع فلوس	فريجدار صغيرة					
280	scale	مِيزَانْ	مِيزَانْ	scale	0	0	0	بسكولة							
281	syringe	زْرِّيقَهْ	زْرِّيقَهْ	syringe	0	0	0	إبرة							
282	tambourine	طَار	طَار	tambourine	6	0	2	طبلة	بنذير	تشتري	دربوكة	دف			
284	tractor	تَرَكتُورْ	تَرَكتُورْ	tractor	2	0	1	جرار	لعبة	كميون					
285	yoyo	يُويُو	يُويُو	yoyo	5	7	2	كبة خيط	زربوط	توپي	لعبة				
286	anteater	آكِل النَّمْل	آكِل النَّمْل	anteater	13	15	1	آكل الخنفوس	سنجاب	نمس					
287	anvil	سَنْدَانْ	سَنْدَانْ	anvil	13	6	2	منظده	مبرد						
288	arch	بَابْ	قُوسْ	gate	4	0	1	قوس	سور	حجر	حيط				
289	armadillo	أَرْمَدِلُّوْ	جَرْبُوعْ	armadillo	12	4	1	آكل النمل	فرس	حيوان زاحف					
290	avocado	غَلَّهْ	أَبُوكَا*	avocado	1	10	4	شطر	لوزة	حجرة	خوخ	قلب	مشماش		
291	bat	خُفَّاشْ	خُفَّاشْ	bat	0	0	0	عصفور	شوف سوري						
292	bird cage	قفَصّ	قفَصّ	bird cage	1	0	3	عصفور	كاج						
293	brain	مُخّ	مُخّ	brain	0	0	1	دماغ	سربو						

294	buffalo	ثَورْ وَحْشِي	جَامُوسْ	buffalo	2	8	2	ثور	بقر الوحشي	خنزير	كركدن	فيل	ماموث	تورو	
295	cactus	هِنْدِي	صَبَّارْ	cactus	6	0	2	كاكتوس	پاپايا	ظلف	هندي	پلونة	نبته	صنو بر	
296	caliper s	مِلْقَاطْ	مِلْقَاطْ	calipers	5	4	5	مقص							
297	cheese	جبِنْ	جبِنْ	cheese	0	1	0								
298	cockro ach	فَرْزِيطْ	خَنْفُوسْ	insect	2	0	3	فرزيت	ڤرلو	ذبانة	عقرب	صرار	ڤعللو		
299	compa ss	بَوْصلَهْ	بَوْصلَهْ	compas s	0	0	2	كرونو	منڤالة						
300	crab	سَرَطَانْ	سَرَطَانْ	crab	0	0	0	عقرب	كراب	قبروص	سرطان البحر	كنسار	فكرون		
301	dinosa ur	دَيْنَصُورْ	دَيْنَصُورْ	dinosau r	0	1	1	كنغرو							
302	doghou se	دَار كَلَب	دَار كَلَب	doghou se	3	0	3	بيت كلب	منزل كلب	نيش	دار				
303	dragonf ly	وَشْوَاشَهْ	فَرَاشَهْ	butterfly	2	0	2	ذبانة	نموسه	حشرة	خنفوسه	پاپيون			
304	easel	لَوْحَهْ	صَبُّورَهْ	board	5	0	2	لوحة	طبلو	ورقة رسم					
305	eel	حَنْشَا	حُوتَهْ	fish	3	6	3	حنش	حنش بحر	ثعبان البحر					
306	fishtail	ذِيلْ حُوتَهْ	ذِيلْ حُوتَهْ	fishtail	1	0	0	بعبوص	بعبوص حوت	ذيل	ذنب الحوته	جناح	زنف		
307	funnel	قَمَعْ	قَمَعْ	funnel	1	2	3	زميرة							
308	hambur ger	هَمْبُرْڤِرْ	هَمْبُرْڤِرْ*	hambur ger	3	0	2	صندوي ش	تبن	كسكروت					
309	hammo ck	فَرْش دُرْجِيحَهْ	فَرْش	bed	8	2	3	دواحة	درجيحة	حمق	بطّو				
310	hyena	ضَبْعْ	ضَبَعْ	hyena	3	0	1	ذيب	إبن آوى	كلب	ثعلب	ظبي			
311	igloo	دَارْ إِسْكِيمُو	دَارْ إِسْكِيمُو	igloo	5	1	3	بيت ثلج	إسكيمو	بيت إسكيمو	كاب	كوخ	دار	بيت فار	
312	jellyfish	حُرِيقَهْ	حُرِيقَهْ	jellyfish	4	2	3	حبار	قرنيطه	حوته					
313	koala	كَوَالاَ	كَوَالاَ	koala	0	2	5	بَنْدَا	سنجاب	راكون	كنغر				
314	ladle	مغَرْفَهْ سقَا	مغَرْفَهْ	spoon	1	0	3	لوش	غراف	مغراف					
315	ladybu g	خَنْفُوسْ البايْ	كُكْسِنَالْ*	ladybug	2	0	2	خنفوسة	أمي سيسي	خنفوس النسا					
316	lamb	عَلِيلِشْ	عَلُوشْ	sheep	0	0	1	معزه	علوش صغير	عجل					
317	lipstick	حُمِّيرْ	حُمِّيرْ	lipstick	0	0	2	روج أ لابر	أحمر شفاه	روج	قلم حمير				
318	lizard	وَزْغَهْ	وَزْغَهْ	lizard	2	0	2	زرزومه ية	سحلية	أمك البويآ	سرعوفه	تمساح	ورل	بوكشا ش	
319	llama	لأمَا	جمَلْ	camel	7	3	3	لاما	الرنه	غزالة	أيل	نعامة			
320	lungs	روَارِي	روَارِي	lungs	0	1	0								
321	moose	أيْل	أيْل	moose	4	6	3	وحيد القرن	ذكر الغزال	جاموس	غزالة	رنة			
322	octopu s	قَرْنِيطْ	قَرْنِيطْ	octopus	1	0	3	أخطبوط							
324	panda	دِبْ پَنْدَا	پَنْدَا	panda	0	1	1	كوالا	دب	دب پندآ					
325	peas	جِلْبَانَهْ	جِلْبَانَهْ	peas	0	1	0	دودآ حرير	لوبيا						
326	pelican	لَقْلَقْ	لَقْلَقْ	pelican	1	2	5	غرنوق	عصفور	طائر					
327	pyrami d	هَرَمْ	هَرَمْ	pyramid	0	0	1	پراميد							
328	rat	جَرْبُوعْ	فَارْ	mouse	0	0	1	جربوع							
329	ray	حَبَّارْ	حُوتَهْ	fish	5	8	3	محار	ورقة	خفاش	حمام البحر	حوت ضو	حبار	فار لبحر	
330	rosebu	بُرْعُمْ وَردَهْ	وَردَهْ	rose	1	0	1	نوارة	نبته						

	d														
331	saxophone		سَكْسُوفُونْ	saxophone	6	1	4	بيبآ	زماره	مزمار	بوق	ترمپاة			
332	scorpion		عَقْرَبْ	scorpion	0	0	0	سرطان	سكرپيون	عنكبوت					
333	shark		قِرْش	shark	0	0	0	رُكان	حوته	سمك قرش	حوت قرش				
334	skeleton		هَيْكَلْ عَظْمِي	skeleton	0	0	0	هيكل عظمي							
335	skull		رَاسْ	skull	0	0	1	راس ميت	سكولات	هيكل عظمي	راس	تات دُ مور			
336	spider web		شَبْكَةُ عَنْكَبُوتَهْ	spider web	3	1	1	شبكه	بيت عنكبوت	عنكبوته	خيط عنكبوت				
337	starfish		نِجْمِةُ بحَرْ	starfish	5	1	2	نجمه	مروحه	إسفنج					
338	stethoscope		سَمَّاعَةُ طِبِّيَّهْ	stethoscope	5	0	3	دقات القلب	سماعات متع طبيب	ستتوسكوپ	تلاسكوپ	سناطا			
339	totem		صَمْبَهْ	totem	6	4	3	توتام	تمثال	خفاش	معبد	سيف	أثار	بوذيزم	
340	toucan		طَوقَانْ	bird	0	1	2	پروكآ	لقلق	ببغآ	نقار الخشب	نسر			
341	turkey		دَنْدُونْ	peacock	0	0	1	دندون	دندونه	داند	ديك رومي	سردوك	سردوك هند	دجاجه	
342	vulture		عِقَابْ	eagle	1	6	3	عقاب	صقر	عصفور					
343	walrus		فِيلْ البَحر	seal	5	1	6	فوك	بطريق	باب	فوكس				
344	washing machine		غَسَّالَهْ	washing machine	0	2	2	غسالة	مشين آ لڤآ	ڤاز	پوبلا				
345	whale		حُوتْ عَنبرْ	whale	3	0	0	حوته	دوفان	قرش	حوت لبحر	حوت لزرق	حوت أبيض	أسد إلبحر	
346	whip		سَوْط	whip	0	4	3	صناره	خيط						
347	wolf		ذِيبْ	wolf	0	0	2	ثعلب	كلب						
348	worm		دُودَهْ	worm	0	2	0	حبل	دودة حرير						
349	accordion	_		پيَانُو*	piano	6	3	0	أكوردیون	آلة موسيقية	سكسوفون	أورڤ				
350	baseball bat	_		مَضْرِبْ	baseball bat	3	1	2	ركات بيزبول	عصا بيزبول	مظرب بيزبول	مظرب تنيس			
351	boot	_		بُوطَ*	boot	0	0	0	صباط	بوتس	بتيون	حذاء			
352	cap	_		كَسْكَاتْ*	cap	1	0	1	طربوشه	مرسآياز	برآ	شپو	برتيلا		
353	couch	_		بَنْك	couch	1	0	1	فوتوي	كنپا					
354	football helmet	_		كَاسْك*	helmet	5	13	1							
355	harp	_		قَانُونْ	qanun	6	7	6	عود	آلات موسيقآ					
356	helicopter	_		هَلِيكُوپْتَارْ*	helicopter	0	0	0	طيارة	لكپتار					
357	mitten	_		قُوَانْدُوَاةْ	gloves	0	1	0	قفاز	ڤان					
358	plug	_		پرِيزْ*	plug	0	2	2	فيشة	خيط متع ضو	ذكير				
359	pocketbook	_		سَاكْ*	handbag	0	0	0	حقيبه	كرطابة	ساك آ دو	صاك آ مان	سكوش		
360	record player	_		إسْطِوَانَهْ	disk	5	6	4	موسيقى	مسجلة	تورن ديسك	علبة موسيقى	رديو	رديو كاسات	لكتور دُ ديسك
361	roller skate	_		بَتنَات	roller skate	2	5	4	رولر	مطور	بسكلات	عربه	پتًا		
362	screw	_		مُسْمَارْ	nail	0	1	0	زنزير	فيس					

363	screwdriver	_	ثُورْنُ فِيسْ*	screwdriver	0	1	1	فيس	مفك براغي							
364	skirt	_	جُوبْ*	skirt	0	0	0	تنوره								
365	skunk	_	سِنْجَابْ	squirrel	3	9	3	صاحب الريحة	ذربان	قنفد	كسلان	فار				
366	sled	_	مِزْلاَجْ	sled	3	9	3	سكي	زلاج	پلونش	جو دُ سكي					
367	thimble	_	سطْلْ	stool	1	7	3	سلة مهملات	محبس	دا	ڤوبلا	كشتبان	كار	كاس		
368	tie	_	كرَافَاةْ*	tie	0	0	0	ربطة عنق	مظلة							
369	toaster	_	ڤْرِي بَانْ*	toaster	5	6	6	مكينه	صندوق	راديو						
370	ferris wheel	_	مَنَاجْ*	ferris wheel	5	4	3	دحدح	درجيحه	لعبه	ڤران وية	نعوره				
371	fire hydrant	_	_	_	5	13	6									
372	lawnmower	_	جَزَّارَهْ	lawnmower	3	8	5	تندوز	آلة جز العشب	ترنكام	تنحي الڤزون	رزوار	مكينه			
373	maracas	_	مَضْرِبْ	racket	4	7	6	ركات	لعبه							
374	microscope	_	مِكْرُوسْكُوبْ*	microscope	0	4	4	تلاسكوپ	منظار	مكبره						
375	paddle	_	رَكَاتْ*	racket	0	1	5	مظرب	ركات تنيس	مظرب تنيس						
376	parachute	_	مِنْطَادْ	parachute	1	0	2		بالون							
377	platypus	_	بَطْرِيقْ	pinguin	4	11	4	حوته	كلب الماء	فكرون						
378	spatula	_	بَالَا	spatula	1	3	1	پلات	مجرف	مغرفة	غرافه					
379	shower head	_	دُوشْ*	shower	0	0	4	سباله	مرش							
380	telescope	_	مِنْظَارْ	telescope	0	6	1	صاروخ	مكبرة	ميكروسكوپ	هورسكوپ	تلاسكوپ	لوپ			
381	thermos	_	تَرْمُوسْ*	thermos	3	5	3	بيبرون	كاس	دبوزة ماء	كفيتيرة					
382	tram car	_	مِنْطَادْ	hot-air balloon	4	12	2	عربه متحركه	تلافريك	طياره	كبيناء					
383	weather vane	_	سَرْدُوكْ	cock	4	8	3	شمس	فلاشات	معلاق	عصفور	دجاجه				
384	zipper	_	سَلْسَلَهْ	zipper	1	10	3	نعورة	تورنوپس	مسمار						
385	baseball glove	_	قُوَنْدُوَاتْ	gloves	1	4	1	قفاز	قان	ڤواندوات						
386	blowfish	_	حُوتَهْ	fish	1	4	0	بوڤشاش								
387	can	_	حُكَّهْ	can	0	1	2	حكه مصبرات	حكة طماطم	سطل متع پوبال	حكة هريسه	پوبال				
388	cymbals	_	عَجْلَهْ	tire	3	8	2	ديسك	أتل	إسطوانة	سد					
389	dart	_	سَهْم	dart	1	6	1	فلاش	زريقة	فلشاة	بلومه	فوشيكا				
390	fishbowl	_	أَكْوَارْيُومْ*	acquarium	4	2	3	بول حوت	بكال	بول	ڤاز	حوتا	حوض متع حوت	حوض متع سمك		
391	flamingo	_	نعَامَهْ	ostrich	3	2	4	فلامن روز	نورس	لقلق	بجعة	وزه	نحام وردي	الحاج قاسم		
392	harmonica	_	يَجُورَهْ	brick	3	8	4	كمنجة	هرمونيكا	سمان	زميره					
393	horses	_	ذكِيرْ	magnet	1	7	2	مغناطيس	صفيحة							

	hoe						س								
394	jar	_	دَبُّوزَهْ	jar	0	0	0	حكة	ملاحة	حكة ملح	علبة	حكة دوآ	پيرون		
395	Pretzel	_	حبْلْ	thread	2	5	0	حنش	خيط	ككي	ڤاطو	خبز	سرپون	حوتا	
396	propeller	_	مَرُوحَهْ	fan	0	5	1	ناعورة	دوامه						
397	spatula	_	بَالَهْ	spatula	2	11	1	مقلات	آلة حلاقه	مرايه	پلات				
398	squash	_	_	_	4	13	3	كرموس	فقوس	بصل					
399	swordfish	_	حُوتَهْ	fish	1	1	2	روكان بلون	سمك	بوسيف	قرش	منشار البحر			
400	thermometer	_	تَرْمُومَاتَرْ*	thermometer	1	1	3	درجات حرارة	ميزان حرارة	مقياس حرارة	ميزان	محرار			

The table presents all items that were given more than one name and/or elicited naming or identificat ion failures. The modal name and other alternative nondominant names given to each picture are listed. Naming failures are also listed under DKN (don't know name), DKO (don't know object) and NR (no responses).

Appendix C – List of stimuli in Experiments 1 and 2

Picture names and French distractors used in Experiment 1

		Distractors			
Target name in French	English translation	Phono-translation	Phonological	Semantic	Unrelated
chaîne balançoire	chain swing	sabot dauphin	chèvre baleine	corde chaise	fourmi table
clé	key	médaille	cloche	porte	tonneau
bougie	candle	chapeau	bouée	ampoule	feuille
canon	cannon	mèche	casserole	pistolet	oignon
canard	duck	barre	camion	poule	toupie
couteau	knife	cercle	couronne	lime	tigre
collier	necklace	chat	cochon	bague	fromage
coq	rooster	sacoche	corne	oie	marteau
cerveau	brain	moto	cerf	tête	pinceau
robinet	faucet	satellite	robe	arrosoir	cœur
barbecue	grill	marin	balance	cuisinière	plume
soleil	sun	chapiteau	sauterelle	étoile	église
salière	Salt-shaker	masque	sabre	bol	crocodile
bouton	button	fée	bouteille	nœud	citron
fleur	flower	natte	flocon	vase	poubelle
tortue	turtle	femme	tomate	grenouille	aiguille
scie	saw	momie	cible	bois	poisson
barrière	fence	souris	bassine	arche	cuillère
selle	saddle	sapin	serpent	tabouret	artichaut
banane	banana	mouche	barbe	raisin	pneu
canapé	sofa	ballon	cage	lit	drapeau

Picture names and TA distractors used in Experiment 2

		Distractors			
Target name in French	English translation	Phono-translation	Phonological	Semantic	Unrelated
chaîne balançoire	chain swing	sal:a dob	ʃɛb:ɛ:k batˁri:q	ħbal korsi	nɛm:ɛla tˁɑ:wlɑ
clé	key	mɛʕla:q	kla:fɛs	bɛ:b	birmi:l
bougie	candle	ʃabka	bulu:na	ʔambu:ba	warqa
canon	cannon	mɛʕza	kalb	fard	bsˁal
canard	duck	batˁa:tˁa	kab:u:t	dʒɛ:ʒa	ʒbɛn
couteau	knife	sɛbta	ku:ba	mɛbrɛd	nɛmr
collier	necklace	ʃaʒra	komidinu:	χa:tɛm	zarbu:t
coq	rooster	sam:a:ʕa:t	kol:ɛb	waz:a	mtˁarqɑ
cerveau	brain	moʃtˁ	sɛrwɛ:l	ra:s	fu:ʃa
robinet	faucet	sawtˁ	ʁoril:a	miraʃ:a	qalb
barbecue	grill	masˁtˁra	bagra	ga:z	ri:ʃa
soleil	sun	ʃak:ɛl	sok:a:ra	nɛʒma	knisia
salière	Salt-shaker	marwħa	sal:u:m	sˁaħfɑ	tɛmsɛ:ħ
bouton	button	fɛlfɛl	bufriwa	gorbi:ta	qa:rɛs
fleur	flower	naħlɑ	flu:ka	maħbɛs	zɛbla
tortue	turtle	fargi:ta	tof:a:ħa	ʒra:na	ʔɛbra
scie	saw	mongɛ:la	siga:ru:	ħtˁab	ħu:ta
barrière	fence	su:ria	ba:nu:	qu:s	mʁarfa
selle	saddle	saratˁa:n	sɛnʒa:b	tˁabu:ria	gɛnɛria
banane	banana	mutˁu:r	bar:ɛ:d	ʕnɛb	ʕaʒla
canapé	sofa	bawsˁla	karhba	farʃ	ʕalam