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Gulf Arabic nouns and verbs: A standardised set of 319 object pictures and 141 action pictures, and predictors of naming latencies.

Abstract

Standardised pictorial stimuli and predictors of successful picture naming are not readily available for Gulf Arabic. Based on data obtained from Qatari Arabic,[1] a variety of Gulf Arabic, the present study provides norms for a set of 319 object pictures, and a set of 141 action pictures[2]. Norms were collected from healthy speakers, using a picture naming paradigm and rating tasks. Norms for naming latencies, name agreement, visual complexity, image agreement, imageability, age of acquisition, and familiarity are established. Furthermore, the database includes other intrinsic factors, such as syllable length and phoneme length. It also includes orthographic frequency values (extracted from AraLex; Boudelaa and Marslen-Wilson, 2010). These factors were then examined for their impact on picture naming latencies in the object and action naming tasks. The analysis shows that the primary determinants of naming latencies in both nouns and verbs are (in descending order) image agreement, name agreement, familiarity, age of acquisition, and imageability. The results indicate that there is no evidence that noun and verb naming processes in Gulf Arabic are influenced in different ways by these variables. This is the first database for Gulf Arabic, and therefore the norms collected from the present study are of paramount importance for researchers and clinicians working with speakers of this variety of Arabic.

1. Introduction

Picture naming refers to the process of describing a presented picture in no more than one word (Bonin, Peereman, Malardier, Mèot, & Chalard, 2003; Kosslyn and Chabris 1990), involving three broad levels of processing: visual analysis, semantic activation and lexical retrieval (Levelt et al. 1999; Dell et al. 1997; Nickels and Howard 1995; Barry et al. 1997). The picture naming task is a widely used experimental paradigm to investigate lexical retrieval in both healthy and unhealthy participants. It is the elementary step towards using language. Since the publication of Snodgrass and Vanderwart's (1980) set

[1] Due to the similarity of the Arabic varieties spoken in the Gulf, these varieties are grouped together under the label "Gulf Arabic" in the literature.
[2] The normative databases and the standardized pictures can be downloaded from http://qufaculty.qu.edu.qa/tariq-khwaileh/download-center/

of 260 pictures, researchers have been developing linguistically and culturally appropriate normative databases for pictures/words/concepts across different languages and varieties, to be utilized in experimental and clinical research fields. Furthermore, the developed normative databases include norms for factors influencing the lexical retrieval process at various levels (e.g. Kosslyn and Chabris 1990; Barry et al. 1997; Bonin et al. 2003). These factors are referred to as determinants or predictors of lexical retrieval and may include: visual complexity of pictures, name agreement, image agreement, imageability, age of acquisition, frequency and familiarity. Bonin et al. (2003) states that the lack of normative databases in a given language or variety results in hindering experimental and clinical research into language processing, leading researchers to develop picture sets that can be highly idiosyncratic, resulting in difficulties matching for relevant factors which could affect the conclusions drawn from these studies.

2. Normative databases

Cross-linguistic standardized pictures databases are commonly used in psycholinguistic research into language production and comprehension. The purpose of developing such databases is to provide readily available stimuli for use in both experimental linguistic research fields, and clinical fields. They are used to investigate how psycholinguistic variables such as name agreement, age of acquisition, frequency of use, and imageability affect the lexical retrieval process in terms of latency and accuracy in both typical (e.g. Khwaileh, Body and Herbert, 2014) and atypical speakers (e.g. Khwaileh, Body and Herbert, 2017). Developing a normative database for a specific geographical region or variation of language, ensures accuracy of results when used in academic and clinical research. Not all languages share the same linguistic features and cultural norms, and for this reason; normative databases for different languages are in demand. The first normative database for English was the Snodgrass and Vanderwart's (1980) set of 260 pictures in American English. This database was then extended to 400 pictures (Cycowicz, Friedman, Rothstein, & Snodgrass, 1997). These two databases have been utilized across many studies into picture naming cross-linguistically (e.g. Boukadi, Zouaidi, & Wilson, 2016; Bonin, Peereman, Malardier, Mèot, & Chalard, 2003; Bonin, Mèot, Chalard, & Fayol, 2002). Normative databases for many languages, such as Dutch (Shao, Roelofs, & Meyer, 2014), Portuguese (Cameirao & Vicente, 2010), Spanish (Alonso, Fernandez, & Díez, 2015), Russian (Akinina, Malyutina, Ivanova, Iskra, Mannova, Dragoy, 2014), French (Bonin, Peereman, Malardier, Mèot, & Chalard, 2003; Bonin, Mèot, Chalard, & Fayol, 2002), Italian (Barca, Burani, & Arduino, 2002), and Turkish (Raman, Raman, & Mertan, 2014), do exist.

However, the majority of the published normative databases in various languages are noun-based: English (Cycowicz, Friedman, Rothstein, & Snodgrass, 1997), Dutch (Shao, Roelofs, & Meyer, 2014), French (Bonin, Peereman, Malardier, Mèot, & Chalard, 2003), and Italian (Barca, Burani, & Arduino, 2002) to name a few. Noun-based normative databases are formulated for object naming tasks to elicit verbal identification for pictures representing nouns. Verb-based databases are developed for the purpose of assessing action-naming. There are fewer verb-based normative databases than their noun counterparts (e.g. Russian: Akinina, Malyutina, Ivanova, Iskra, Mannova, & Dragoy, 2014; French: Schwitter, Boyer, Moet, Bonin, & Laganaro, 2004).

3. Nouns vs. verbs processing

Processing of nouns and verbs has been the interest of many studies that aimed at finding whether grammatical class affects language processing. Two different assumptions emerged on processing of nouns and verbs. The first suggests that different grammatical classes may be processed differentially under the assumption that they are neurally separable (e.g. Pinker, 1994). This view has relied on double dissociations reported in aphasia case studies, in which patients showed an advantage of verbs over nouns (e.g. Miceli et al., 1984; Zingeser and Berndt, 1988), or patients showing greater impairment in verbs than in nouns (e.g. Caramazza and Hillis, 1991), which depends on the aphasia profile of the patient, leading researchers to conclude that nouns and verbs must be represented separately psychologically and neurally (e.g. Damasio andTranel, 1993). Within this framework, it is hypothesised that verb processing is more difficult than noun processing, and that action-naming causes various and higher demands on language processing than object-naming, due to the more demanding nature of verb-processing (Akinina, Malyutina, Ivanova, Iskra, Mannova, & Dragoy, 2014). Per Mätzig et al. (2009), verbs may be less imageable but have more complex representations than nouns. Another factor to consider is the organizational features of nouns versus verbs. Masterson, Druks, & Gallienne (2008) explained that nouns may exist independently as objects in the world, whereas; verbs do not, on the contrary they bear reference to the nouns related to them in terms of instrumentality, location, and actor. Verbs have various argument structures; making it difficult to make generalizations from one verb to another, while it is easy to generalize rules from one noun to another, as in the case of plural marker “s” in English (Mätzig et al., 2009). Additionally, verbs are not as easily imageable as nouns.

The second view was first introduced by Sapir (1921) and later studied by functionalist specialists (e.g. Bates and MacWhinney, 1982). This view assumes that grammatical classes are neither behaviorally nor neurally separable. Rather, the perceived difference is an elusive byproduct of semantic/pragmatic distinctions dependent on frequency and co-occurrences within language. Vigliocco et al. (2011) carried out a comprehensive review of behavioral, electrophysiological, neuropsychological and imaging studies on nouns versus verbs distinctions and concluded that grammatical class is not an organizational principle of knowledge in the brain. They state that the varying results reported in the literature can be attributed to different language typologies depending on semantic/pragmatic and distributional cues in different languages that distinguish nouns from verbs; different languages differentiate between nouns and verbs in different ways. For example, Arabic nouns and verbs select different vocalic patterns and CV-Skeletons at a morpho-phonological level. Vigliocco et al. (2011) further elaborate that grammatical class (noun-verb) distinction in processing is evident only when a word plays a role in phrase and sentence contexts, as opposed to single word processing.

Studies investigating noun-verb distinction within sentence and phrase frames report differences between nouns and verbs, whereas single word processing studies report similarity in processing nouns and verbs (see Vigliocco et al., 2011 for a full review). In support of this view, Scott (2006) found that verbs and nouns actually share the same neural network that is activated upon encounter with nouns and verbs.

Nevertheless, Bird, Franklin, and Howard (2000) argue that imageability influences the word retrieval in nouns more than it does in verbs, because, the imageablity of verbs is lower than imageabilty of nouns. However, Berndt, Haengiges, Burton, and Mitchum (2001) report that imageabilty is not the only factor that affects action-naming, but factors, such as instrumentality of the verb, name relation between an instrumental verb and the name of the instrument and argument structure, all these can influence word retrieval of verbs. In addition, Bastiaanse and Van Zonneveld (1998, 2005) report that age of acquisition influences word retrieval for both nouns and verbs, where the later the age of acquisition the lower the performance in word retrieval. The authors add, imageability plays a big role in word retrieval of nouns and verbs together; the more concrete they are the easier it is to retrieve them. As for the word class factor, it has been confirmed that the retrieval of verbs is more difficult than that of nouns. The authors attribute this difficulty to the grammatical encoder, where verbs activate more information and lemma information than nouns, requiring a more complex grammatical encoding than nouns.

Previous studies developing verbs normative databases have investigated the predictors of verb retrieval. Akinina et al (2014) examined the effect of name agreement, familiarity, subjective visual complexity, age of acquisition, imageability and image agreement on 414 black-and-white drawings of actions. They report a significant effect of name agreement and imageability on verb retrieval, suggesting that verbs which evoke images more easily tend to be named more uniformly. Another aspect which may affect latencies in action-naming is the mode in which the material is presented; d'Honincthun & Pillon, (2008) found that difficulty and latency in action naming was eradicated when a participant were shown video-taped and verbal stimuli rather than photographic stimuli. d'Honincthun & Pillon further argue that due to the fact that verbs tend to bear inflection more than nouns, processing takes longer due to the decisions that must be made on what verb to use in what context, and what inflection to use in a certain context; on top of the lexical retrieval process. However, it has also been suggested that there is no difference in the processing of nouns and verbs, as reported above.

4. Predictors of picture naming latencies

Previous studies developing normative databases, have investigated the impact of psycholinguistic factors on lexical retrieval. A number of factors have been found to influence lexical retrieval in healthy speakers cross-linguistically. These factors are properties of the stimuli and they contribute to the speed and accuracy of lexical retrieval. Variables such as visual complexity, word frequency, age of acquisition, name agreement, image agreement, imageability, familiarity, and word length are investigated in research utilizing picture-naming tasks.

Visual complexity pertains to the complexity of the lining/details of an image, and has been found to influence the naming latencies of picture naming (Ellis & Morisson, 1998). Findings from Shao et al's (2013) study indicate that action pictures that are less visually complex have higher imageability and image agreement; suggesting that the less visually complex an image is, the easier it is to evoke a mental image, and the more accurate the mental image is to the target. However, some studies have found that visual complexity in object naming does not robustly influence naming latency in healthy speakers, as per (Barry et al., 1997; Bonin, Chalard, Méot, & Fayol, 2002; Bonin et al., 2003; Cuetos et al., 1999; Khwaileh, Body & Herbert, 2014; Snodgrass & Yuditsky, 1996). *Word frequency* refers to how frequent a word is used (spoken or written form) in a given language. Previous research suggests that the higher the word frequency, the faster the reaction and the higher the accuracy is in picture naming tasks (Martein,1995; Morrison, 1993; Nickels, 1997). Furthermore, word frequency and age of acquisition have been found to be interrelated, per Meschyan & Hernandez (2002); words that are acquired earlier tend to be higher in frequency and they may have stronger lexical representation (Meschyan & Hernandez, 2002). Word frequency is often established through extracting frequency values from corpora or through rating tasks (e.g. Boukadi, Zouaidi & Wilson 2015). *Age of acquisition* relates to the age at which certain words are learnt. The earlier a word is the learned, the faster and more accurately it is processed (e.g. Akinina, Malyutina, Ivanova, Iskra, Mannova, Dragoy, 2014). Age of acquisition has been reported to affect the latency and accuracy of word retrieval in previous studies (e.g. Akinina, Malyutina, Ivanova, Iskra, Mannova, Dragoy, 2014; Bonin, Mèot, Chalard, & Fayol, 2002; Bonin, Peereman, Malardier, Mèot, & Chalard, 2003; Cameirao & Vicente 2010). *Name agreement* refers to the degree to which participants produce the same name to a given picture. A picture may call to mind more than one name, and a given name can call to mind different pictorial representations (Khwaileh, Body, and Herbert, 2014). Pictures with high name agreement have been found to have shorter naming latencies (Alario and Ferrand 1999; Barry et al. 1997; Bonin et al. 2003; Bonin, Mèot, Chalard, & Fayol, 2002; Boukadi, Zouaidi & Wilson 2015). *Image agreement* pertains to how accurate or close the mental image of a concept is to the presented stimulus. The higher the image agreement rating of an object is, the shorter the naming latency (Alario & Ferrand, 1999), conversely; items with low image agreement, take longer to retrieve due to competition at the visual recognition level (Barry et al 1997). According to Alario and Ferrand (1999), image agreement intercorrelates positively with name agreement; the higher the name agreement of a stimulus, the higher the image agreement. Alario and Ferrand (1999) attribute this to the number of competitors during the lexical retrieval process, in which items with high name agreement have fewer competitors, leading to a faster and more accurate response. *Imageability* refers to the ease of conjuring a mental image to correspond with a presented word (e.g. Akinina, Malyutina, Ivanova, Iskra, Mannova, & Dragoy, 2014; Khwaileh, Body, Herbert, 2014). This variable is significant as the higher the imageability of a given word is, the higher the semantic richness and therefore the faster the response of picture naming

(Akinina et al, 2014; Khwaileh, Body, and Herbert, 2014; Nickels, & Howard, 1995). This can be attributed to the assumption that words with high imageability may have stronger visual and verbal representation Previous studies report that words with high imageability are acquired earlier, and are more familiar, shorter, and have more tendency to have orthographic neighbours than words which are less imageable (e.g. Stadthagen-Gonzalez, & Davis, 2006). *Familiarity* pertains to how familiar an object or word is within a specific language and sphere of experience (Boukadi, Zouaidi & Wilson 2015). It has been found that concepts and words with high familiarity of a concept or word are retrieved faster in picture naming tasks (Boukadi et al., 2015; Akinina et al., 2014; Barca, Burani, & Arduino, 2002). Furthermore, Boukadi et al. (2015) reported strong correlations between familiarity and frequency, suggesting that the names of the most familiar objects are more frequently used or heard in everyday communication. *Word length* concerns the number of syllables or phonemes present within a word. It is assumed that long words take longer time to process in production tasks (Akinina, et al., 2014). However, Alario et al. (2004) found that the number of phonemes in a word does not contribute significantly to naming latencies; they also found that shorter syllable length did not predict shorter latency. Instead, Alario et al. (2004) established that longer words caused shorter latencies; and tri-syllabic words were processed faster than the mono-syllabic and bi-syllabic counterparts. They conclude that the effect of word length on naming latencies from healthy speakers is disputed, and therefore the issue warrants further investigation.

With regard to the Arabic language, there are two published normative databases for nouns; the Levantine-Arabic database (Khwaileh, Body, & Herbert, 2014) and the Tunisian-Arabic database (Boukadi, Zouaidi, & Wilson, 2016). Verbs and adjectives normative databases do not exist for any of the Arabic varieties. To the best of our knowledge, normative databases for Gulf Arabic are not readily available neither for nouns nor for verbs. The aim of the current study is to develop a set of standardized object and action pictures for Gulf Arabic, and to determine the predictors of successful retrieval from pictures of nouns and verbs in the variety under investigation.

5. Gulf Arabic

Although Modern Standard Arabic (MSA) is a variety of Arabic that is used and understood across the Arab region, its use is restricted to writing and formal settings. Instead, local and regional Arabic varieties are used for everyday communication. Contemporary Arabists generally classify modern spoken varieties into the following dialect groups: Egyptian Arabic, Meghrebi Arabic, Yemeni Arabic, Iraqi Arabic, Levantine Arabic, and Gulf Arabic (Versteegh 1997; Holes 2004, Mustafawi, forthcoming) due to linguistic and geographic considerations. Gulf Arabic is a label for the varieties of Arabic that are spoken by more than 26 million citizens in the area including the states of Kuwait, Bahrain, Qatar, Saudi Arabia, the United Arab Emirates, and Oman. This does not mean that Arabic speakers from the Gulf speak in a completely identical way as variation may exist even within the same country or city (Johnstone 1967). However, there are certain linguistic attributes that distinguish Gulf Arabic from other Arabic dialect groups. Since the current paper is based on single words, we will restrict our illustration of the difference between Gulf Arabic and other Arabic dialect groups to aspects of the phonology and the lexicon of the language.

With respect to the phonology of dialect groups, there are a number of phonemes that exist in some dialects or dialect groups but not in others. For example, the affricate /tš/ is part of the phonemic inventory of Gulf Arabic (GA) but is absent from Egyptian Arabic, and from most of the dialects of Levantine Arabic and Meghrebi Arabic. Similarly, there are phonemes that may exist in other dialect groups but not in GA. Examples of such phonemes are /ḍ/, /ẓ/, and /ž/ whose counterparts in GA are /đ/,/đ/, and /dž/, respectively. Also, the phoneme /g/ of GA is represented by the phoneme /ʔ/ in Egyptian Arabic and most of the dialects in the Levant. Also, there are differences in the number and quality of vowels in addition to vowel length among Arabic dialect groups (Ghazali et al. 2007). In terms of syllable structure, GA and Iraqi Arabic permit more variation than the rest of the dialect groups. There are also differences among the dialect groups in terms of stress patterns and the application of certain phonological processes. For a detailed discussion of phonological differences among Arabic dialect groups, the reader is referred to Mustafawi (forthcoming) and references therein.

As for the lexical differences among the dialect groups, the disagreements appear due to the existence of synonyms in the Arabic language in general, with each dialect adopting a specific form or forms. Adopting loanwords from other languages by certain dialects also contribute to the observed lexical disagreements. Table 1 should provide a sample of such disagreements. The Gulf Arabic items are obtained from the current study, the Levantine Arabic nouns are obtained from Khwaileh, Body and Herbert (2014) and the verbs from the first authors whose a native speaker of Jordanian Arabic. The Meghrebi items were obtained from a native speaker of Tunisian Arabic, and the Iraqi items were obtained from a native speaker of Baghdadi Arabic. Some of the listed items exemplify phonological differences among the dialect groups that were referred to above.

Table 1. Examples of nouns and verbs variations across spoken Arabic dialects

Nouns	**Gulf Arabic**	**Levantine Arabic**	**Egyptian Arabic**	**Meghrebi Arabic**	**Iraqi Arabic**
A ball	ku:ra	ṭa:be	ku:ṛa	ku:ra	ṭo:ba
A window	diri:ša	šubba:k	šibbæ:k	šibba:k	šubba:tš
An ashtray	ṭaffa:ya	makatte	ṭaffa:yit sagæ:yir	sandriya	Minfađa
A fish	smitša	samake	samaka	ħu:t	Simtša
A pillow	maxadda	wisa:de	maxadda	maxadda	Mxadda
A heater	daffa:ya	ṣo:be	daffæ:ya	saxxa:n	ṣo:pa
Verbs					
He cries	yṣi:ħ/yabtši:	yibki:	biyʕayyaṭ	yibki:	yibtši:
He falls	yṭi:ħ	yu:gaʕ	biyuʔaʕ	yti:ħ	yo:gaʕ
He pushes	ydizz	ydizz	biyzuʔ	ydizz	yidfaʕ
He vacuums	yxumm	ykannis	biyiknis	yuknus	Yiknus

On the other hand, and as indicated above, in most of the Gulf countries, two Arabic varieties are used, an urbanized variety and a Bedouin variety[3]. The main differences between these two varieties is a few disagreements in morpho-syntactic structures and very few phonological attributes. This made us ensure the inclusion of a representative

[3] More variation exists in larger countries such as Saudi Arabia and Oman.

group from each of the two varieties in Qatar expecting to end up with two databases, one for urbanized Gulf Arabic and one for Bedouin Gulf Arabic. However, after conducting the experiment we could not find significant difference in the outputs of the two groups and hence we excluded this distinction from further analysis or reporting. We believe that the reason for observing no differences between the outputs of the speakers of the two varieties is the fact that the outputs that were sought in the picture naming experiment consisted of single words. This automatically made the few morpho-syntactic differences between urbanized Qatari Arabic and Bedouin Qatari Arabic irrelevant, since these differences can only appear in longer strings (phrases and sentences). The only other difference between the two varieties is phonological, and this has, to a great extent, leveled over the years, partially, due to the process of Standardization (Al-emadidhi, 1985) which was the result of spread of formal education and mass media and partially due to the constantly increasing opportunities for contact among the speakers of the two varieties.

6. Method

6.1 Participants

The participant were 170 (39% males; 61% females) native speakers of Qatari Arabic from three volunteer centres in Qatar, including undergraduate and graduate students from Qatar University. They were informed beforehand that in order to participate, they must be native speakers of Bedouin or Hadari (Urbanized) Qatari Arabic, and should be above 18 years of age. All participants had normal or corrected-to-normal vision. A questionnaire was used to gather demographic information about the participants and their linguistic background. Out of the 170 participants, 122 were speakers of urbanized Qatari Arabic; 35 were speakers of Bedouin Qatari Arabic; and 13 were speakers of a mixture of urbanized and Bedouin Qatari Arabic. The average age for participants was 31 years old (range: 18 to 51 years old). All 170 participants had completed their secondary education, of which 66 held an undergraduate degree at the time of the experiment, and 104 were still studying for their undergraduate degree at the time of the experiment. Participants were asked to sign informed consent forms, and were provided with an information sheet to explain their role in the study. The study was ethically approved by the Qatar University IRB committee.

6.2 Design

The aim is to develop matched pictorial sets for use in research and clinical work , the design included a picture-naming task that was conducted to establish naming latency and name agreement. Two picture-rating tasks were undertaken to establish image agreement and visual complexity. Three word-rating tasks were carried out to establish familiarity, age of acquisition and imageability norms. The apparatus used for the picture naming tasks consisted of the Presentation software which is a response recorder. It controlled the presentation of the pictures, and it automatically recorded latencies in milliseconds from the time the picture was presented until the onset of the response. If the participant did not respond within 5 seconds, the software presented the next stimulus. The computer automatically saved the data to an excel sheet and saved sound files of the responses. All rating tasks were presented in separate booklets attached to individual answer sheets for the participant to write down ratings based on a scale of 1 to 5 (for image agreement, visual complexity, and familiarity) or 1 to 7 (for imageability and age of acquisition) next to each word stimulus presented in the answer sheet. The use of different scales for different variables is due to the nature of each variable in question. For example, age of acquisition requires a larger scale than visual complexity due to the high variability in age of acquisition ratings as opposed to visual complexity, which can be either complex or easy with less rating points in between (Alario et al 2004; Biederman, 1987; Paivio et al., 1989; Snodgrass & Corwin, 1988; Snodgrass & Yuditsky, 1996; Shao et al 2015; Bonin et al., 2004; Cuetos & Alija, 2003; Schwitter et al., 2004).

For the image agreement and visual complexity tasks, pictures were projected onto a laptop screen for individuals, or on a large white screen by an overhead projector for groups. All items were randomised using the randomising function on Microsoft Office Excel. Four different lists were generated i.e. A, B, C and D. Randomising the order was conducted to avoid the effect of word location in the set on picture naming. Each of the four different word lists was checked for semantic relatedness and initial phonemes of neighbouring words, to ensure that successive items did not share semantic features or initial phonemes. The randomisation process was repeated for all rating tasks in the current experiment. Each participant received different order of the stimuli in each task presented in the same session. A given participant would have done list A in the picture naming task, list B in the visual complexity task, list C in the age of acquisition task. In the second session, they would have done list D for the imageability task, list A for the familiarity task and list C for the image agreement task.

6.3 Materials

The materials used in the current study consisted of 334 line drawings representing concrete nouns, and 170 line drawings representing action verbs. The selection of the these nouns and verbs was based on most occurring nouns and verbs in Gulf drama and television programs and in everyday interactions within the Qatari society. The line drawings representing the nouns and verbs were drawn by three artists. These pictures were redrawn when found to be ambiguous or culturally inappropriate. An instance of this is a picture of a glass; which illustrated a drawing of a wine glass. This was not in line with cultural norms and did not represent the prototype of a glass in the Arab (Qatari) culture; which is a glass with no stem. An instance of actions, is the verb 'to fish' which illustrated a man using a fishing rod. This representation was not in line with the Qatari culture. However, sea activities have been part of the Qatari Hadari/urban culture for centuries; so a prototypical image of a man fishing would be a fisherman using a traditional net called the 'ghazal' instead of a fishing rod. To maintain consistency of the style of drawings across the categories, two of the artists who used the same drawing software were assigned a list of nouns; and the third artist was allotted the list of action verbs which were to be drawn by hand on paper. The drawings were originally drawn to A4 size, and were then presented as digital files. Further, the artists were given specific guidelines that emphasised that the objects and the actions must be drawn with respect to the local culture. Each picture was shown individually to 3 Bedouin speakers, and 3 Hadari /urbanized speakers (mean: 24 years old; 2 males and 4 females) who were not involved in the normative study. They had to assign a name to each object and action depicted by the drawings. They were asked to provide feedback about culture appropriateness and the name used to describe the drawing. Items agreed upon by the native speakers were kept for the normative study, and were used to collect norms for naming latencies, name agreement (through the picture-naming task), image agreement, and visual complexity (through rating tasks).

6.4 Procedure

The data was collected over four sessions with two weeks in between each session. In the first session, all participants completed the picture naming tasks, the visual complexity rating tasks, and the age of acquisition rating tasks. The average administration time for session one was 50 minutes per participant. In the second session, which was administered two weeks after the first one, 148 participants out of the 170 participants participated in the imageability rating task (22 participants were not available at the time when the second session was administered). The average administration time for session two was 15 minutes per participant. Two weeks later the participants were invited to complete the familiarity rating task, 116/170 participants participated in this task. The image agreement task was carried out two weeks after the familiarity task, and 121/170 participants participated in this task. The rationale for separating the sessions was to prevent memory and priming effects in the imageability, familiarity and image agreement rating tasks.

All sessions were conducted in a sound proofed room. At the beginning of each session participants were encouraged to respond carefully and consistently to each task. At the start of each task, participants were given instructions and were taken through practice items prior to commencing the task in question, followed by feedback. Instructions were given in Arabic; rating scales and other written materials were in Arabic script. A full description of each task conducted in the current experiment is reported below. The tasks below are presented according to their order of administration. The researcher controlled the presentation of all tasks, and participants were given the opportunity to take a break.

The picture naming task was performed individually in isolated rooms, and all rating tasks were performed either individually or collectively, depending on the number of participants available during the same time. At the beginning of each rating task, instructions were provided in writing and verbally by the experimenter, along with each task’s rating scale printed inside the task booklet. The experimenter explained to the participants that they were free to use any number on the scales, as long as it indicated their true judgement. A booklet for each of the 5 rating tasks was prepared with separate answer sheets. In the imageability, familiarity, and age of acquisition task booklets; a list of all the nouns and verbs appeared under two categories in writing. A list appeared under the Bedouin dialect, and a list appeared under the Hadari/urbanized dialect. Both varieties were listed in parallel inside each task booklet, in correspondence to the same item, and participants were asked to use the list that corresponds to their dialect. In the image agreement and visual complexity tasks, a list of the nouns and verbs corresponding to their projected pictures appeared under each category. Participants were asked to rate the list of words which appeared under the category of the dialect they speak as their mother tongue. In the case that the participant speaks both dialects as their mother-tongue i.e. with each parent speaking a different dialect, they were asked to rate the list which corresponds to their mother's dialect.

During the picture naming tasks, participants sat at a distance of 50 cm from a laptop screen. They were initially shown the line-drawings of objects, and were asked to say out loud the first name that comes to mind, as quickly and as accurately as possible. The researcher explained that the task was to name the object in the picture using one word only, and to avoid describing it. The same instructions were applied for the second group of the action drawings, in which the focus was to name the action being carried out in the picture, rather than the object itself, using one word only. The software used for these tasks, presented a signal in a form of a cross (+), which appeared in the centre of the screen for 1000ms. immediately followed by the picture. The cross served as a prompt to look at the centre of the screen in preparation for the upcoming picture, which remained for 5 seconds before the next stimulus appeared. When the participant could not recognize the picture or did not know the name of the picture, they were asked to say out loud that they could not recognize the object/action, and the researcher would take a note of the item to revisit after the experiment and delete it's naming latency from the list. The average time of administration of the picture naming task was 20 min. All sound files were exported to PRAAT (Version 6.0.08), and each sound file was revisited to make sure that the software did not include false triggering of noise or 'em' or 'err'. False triggering and failures to press the response time key were noted, and were revisited at the end of each task. Responses were transcribed and coded by the first author using a numerical coding system (Appendix A.). Only pictures which were named accurately within the allotted time frame (5seconds) were scored as correct.

In the image agreement task, participants were asked to rate how closely each picture resembled their own mental image of the noun/action provided in writing in the answer sheet. They were first shown a section with nouns to rate, and then a section with verbs. For every word, they were given approximately 3 seconds to form a mental image of it, then were shown the corresponding picture on a screen and were asked to rate the degree of agreement between the picture and their mental image using a 5-point scale. "1" indicated low agreement, and "5" indicated high agreement. The average administration time for this task was 20 minutes.

During the visual complexity task, participants were asked to rate the degree of complexity of each drawing using a 5-point scale. They were first shown a section with nouns to rate, and then a section with verbs. They were informed that they should rate the complexity of the drawing, rather than the complexity of the real-life object/action it represented. 'Complexity' was defined by the amount of details and lines in each drawing. “1” corresponded to very simple, and “5” corresponded to very complex. The average administration time for the visual complexity task was 20 minutes.

In the imageability task, the participants were asked to indicate whether each word evoked a mental image with great difficulty (rated 1) or very easily (rated 7). In the age of acquisition task, the participants were asked to estimate the age at which they thought they learned each word presented in the booklet. They were informed that the estimate should not only attribute to when they had first heard the word, or when they first learned to speak it, but to estimate the age at which they first understood the word when it was used in front of them. In this task, the values in the scale corresponded to 2-year age bands, with “1” corresponding to 0-2 years, and “7” corresponding to 13 years or after. In the familiarity task, the participants were asked to rate the degree of familiarity of the item in terms of how usual/unusual the word was in their realm of experience, regardless of its meaning. Participants were informed that the rating had to be attributed to how often they come across the word itself, rather than its concept, either in its heard, spoken, or written form. A word they come across very often is rated as “5” , and a word they never see or hear is rated as “1”. The average administration time for each of the three rating tasks was 20 minutes.

6.5 Frequency and intrinsic features

The frequency of the orthographic form for each item in the nouns and verbs sets were extracted from the AraLex (Boudelaa and Marslen–Wilson 2010). The frequency of orthographic form for each word was included as a compensatory measure for spoken frequency, due to the fact that frequency corpora for Gulf Arabic are not readily available. Available frequency corpora on Arabic are drawn from Arabic written material (see Buckwalter Arabic Corpus 1986–2003, An-Nahar Corpus, ELRA ELRA), and Modern Standard Arabic (e.g. Aralex database, Boudelaa and Marslen–Wilson 2010). Furthermore, other variables which are intrinsic features of words (can be determined directly from their surface structure) were included in the database. These are gender, animacy, rationality, pluralization type for nouns, and number of syllables and number of phonemes for both nouns and verbs.

7. Results

The original 334 object pictures and 170 action pictures yielded naming latencies for the nouns and verbs in question. All items in question were rated for imageability, image agreement, name agreement, age of acquisition, familiarity, and visual complexity. Intrinsic values (syllable length, phoneme length, orthographic frequency) for the nouns and verbs were also extracted. The data was analyzed to establish norms for the various variables. Further analyses investigated the influence of the independent variables on naming latencies of nouns and verbs.

7.1 Picture naming task data

Coding the responses from the nouns and verbs picture naming tasks was based on a 10-category coding system: correct response, visual errors, semantic errors, phonological errors, morpho-syntactic errors, unrelated errors, tip-of-the-tongue, don't know name of (the object/action), don't recognize (the object/action), and finally 'no response' errors (i.e. unproduced responses within 5 seconds). For the noun picture naming, the coding issues were minimal as most responses were accurate, they mainly included the production of visually or semantically related items, however most of these items had low frequency values and familiarity ratings, for example, producing 'screw' /sɪkru:b/ in Qatari Arabic for pictures of a 'pin' or a 'needle'. The coding of verbs/actions picture naming was more challenging. Examples of such issues included instances of producing alternative masculine verb form instead of the feminine verb form (e.g. /jħɪb/ [masculine] to /tħɪb/ [feminine] 'to kiss'). This was considered a morpho-syntactic error indicating a different gender to the target word. It could have been considered an acceptable alternative since it shares the same consonantal roots, but this would have affected the sensitivity of detecting morpho-syntactic errors when the database is used with patients with agrammatism. Another instance of such issues was the production of a verb which intrinsically involves a doer instead of the target form which rather involves the action being centred on the object itself(e.g. /jɪnzɪf/ 'to bleed' to /jɪdʒrɑħ/ 'to hurt'). This was considered a visual/semantic error.

The picture naming task yielded naming latencies and recorded responses for 334 nouns and 170 verbs/actions. Only latencies for accurate responses were included. All the naming latencies and responses were manually checked for false triggers using PRAAT (Boersma and Weenink 2009; version 5.1.17). Responses not produced within 5 seconds, and responses which were coded as either tip-of-the-tongue errors, 'don't know name', and 'don't know object/action' errors were removed from the database. The total number of items removed from the nouns' set was 15 items, and from the verbs' set 29 items. Removing these items from the database resulted in naming latencies for 319 nouns, 141verbs and their pictorial representations. The name agreement ranges for nouns and verbs are shown in table 2. Finally, the data was checked for outliers. To remove the effect of extreme outliers on the reaction time data, the 5% trimmed means procedure was performed (Pallant, 2005). This procedure replaced extreme outliers with values of the mean plus two standard deviations and recalculated a new mean for each item. Naming latencies of two standard deviations and above were deemed outliers, and were removed using the trimmed means procedure, prior to the analysis for both nouns and verbs.

Table 2: The name agreement subsets for the noun and verbs

Name agreement percentage (%)	**Number of nouns**	**Number of verbs**
100 – 90	145	18
89 – 80	67	18
79 – 70	35	14
69 – 60	25	17
59 – 50	17	17
<50	30	57
Total number	319 items	141 items

Items with low name agreement were kept in the database to maintain a wide range of variance of the data for future research use in investigating effects of name agreement. Within clinical contexts, clinicians can select the items with high name agreement from the databases. Researchers may need more variance in name agreement values depending on the purpose of their research.

7.2 Rating tasks data

The rating tasks yielded visual complexity, imageability, image agreement, age of acquisition, and word familiarity for the 319 nouns, and 170 verbs. Participants with ratings falling more than 3 Standard deviations away from the average mean were excluded, in line with Schock, Cortese, & Khanna (2012), and Bakhtiar, & Weekes (2015). Cronbach's alpha revealed high internal consistency across nouns' ratings: visual complexity (α =.904, n=334), imageability (α =.821, n=334), image agreement (α =.912, n=334), age of acquisition (α =.781, n=334), and word familiarity (α =.793, n=334). Within verb ratings, Cronbach's alpha showed that the internal consistency for visual complexity (α =.741, n=170), imageability (α =.791, n=170), image agreement (α =.723, n=170), age of acquisition (α =.711, n=170), and word familiarity (α =.801, n=170) was high. This shows that the internal consistency of ratings was above moderate (α >.500), indicating that participants were rating every item in the set consistently.

The means and standard deviations for naming latencies, ratings of visual complexity, imageability, image agreement, age of acquisition, and word familiarity were calculated to establish the norms for the nouns, verbs and their pictorial representations. The percentage of participants agreeing on a given name for the pictures representing the nouns and verbs was established as a measurement of name agreement. Variables that are intrinsic features of the nouns, and verbs were also included in the final database (e.g. phoneme number, syllable number and gender). The final database included norms for 319 object pictures and 141action pictures, along with their ratings for the above mentioned variables. The databases and the standardized pictures can be downloaded from http://qufaculty.qu.edu.qa/tariq-khwaileh/download-center/. Table 3 summarises the means and standard deviations for all the variables in the database.

Table 3: summary of the database: means and standard deviations.

Variable	Nouns		Verbs	
	Mean	**Standard deviation**	**Mean**	**Standard deviation**
Naming latency	1601.02ms	416.3ms	1793.69	382.58
Name agreement (%)	0.86	0.17	0.73	0.21
Visual complexity	2.46	0.81	2.73	0.64
Image agreement	4.36	0.42	4.45	0.42
Imageability	6.10	0.36	5.93	0.36
Age of acquisition	3.63	0.68	3.91	0.67
Familiarity	3.71	0.51	3.96	0.39
Frequency	3.29	0.93	3.21	0.83
Phoneme length	5.23	1.29	6.07	0.93
Syllable length	2.17	0.73	2.31	0.46

7.3 Predictors of naming latencies in Gulf Arabic nouns and verbs

To determine the significant predictors of nouns and verbs retrieval, trimmed naming latencies underwent correlations, multiple regressions, and principal component analysis (Factor Analysis). This procedure was carried out for nouns only, verbs only, then the nouns and verbs combined. The dependent variable was the trimmed naming latency, and the independent variables were syllable length, phoneme length, initial phoneme (multiple regression only) frequency, imageability, image agreement, name agreement, age of acquisition, familiarity, and visual complexity. Word class (nouns versus verbs) was added as an independent variable for the analysis of nouns and verbs combined.

7.3.1 Analysis of nouns

In preparation for the analysis of the 319 nouns, a total of 27 items were removed from the analysis: 8 nouns yielded compound nouns with no length data; 8 nouns with no frequency data; and 11 nouns that had a name agreement value of less than 40%. The final set of nouns included 292 items. To explore the relationship between the variables in question, their strength and direction, the Pearson Correlations was carried out. These relationships are demonstrated in table 4.

Table 4 Correlation matrix for nouns only

**Significant at the 0.01 level

	Syllable length	Phoneme length	Frequency	Name agreement	Visual complexity	Image agreement	Age of acquisition	Imageability	Familiarity	Naming latency
Syllable length		.842**	-.120*	-.036	.108	.048	.073	.009	-.040	.031
Phoneme length			-.142*	.024	.078	.032	.108	-.029	-.40	.089
Frequency				.010	.039	.039	-.066	.108	.188**	-.221**
Name agreement					.008	.289**	-.225**	.260**	.129*	-.589**
Visual complexity						-.167**	.094	-.269**	-.177**	.132**
Image agreement							-.142*	.275**	-.001	-.434**
Age of acquisition								-.483**	-.581**	.442**
Imageability									.480**	-.467**
Familiarity										-.299**
Naming latency										

*Significant at the 0.05 level

There are significant correlations of nouns naming latencies and (in descending order): name agreement, age of acquisition, imageability, image agreement, familiarity, frequency, and visual complexity. All of these are in the expected direction. There are substantial correlations between the independent variables. All these correlations were in the expected direction. For example syllables and phonemes correlate at .822; this makes it challenging to have an independent effect in predicting naming latency as they are strongly related. Other notable significant correlations were in the .129 to .483 range, allowing the inclusion of those in the multiple regression model.

The standard multiple regression procedure was carried out to explore the predictive ability of the independent variables on naming latency. All variables included in the correlation table above were included as independent variables. The included data met the assumptions of normally distributed residuals, homogeneity of variance and multicollinearity. The data contained no outliers. The model accounted for 57.1% (R^2 = .571) of the naming latency variance. The regression was significantly different from zero ($F(9, 282)=42.61$, $p<.001$), suggesting that the model was appropriate for the investigated data. The regression analysis revealed that factors significantly predicting naming latency in descending order were: name agreement (Beta=-.456, $t(116)= -10.37$, $p<.05$); image agreement (Beta=-.264, $t(48)=-5.65$, $p<.05$); age of acquisition (Beta=.216, $t(35)=4.32$, $p<.05$); frequency (Beta=-.171, $t(20)= -4.12$, $p<.05$); familiarity (Beta=-.145, $t(48)=-3.42$, $p<.05$); and visual complexity (Beta= .101, $t(24)= 3.01$, $p<0.05$). Other variables did not show significant contribution to the naming latency variance: Initial phoneme (Beta=.354, $t(27)=.101$, ns.), phoneme length (Beta=.173, $t(27)=2.01$, ns.), syllable length (Beta= -.141, t (47)= -2.21, ns) and imageability (Beta=-.091, t(65)=-1.67, ns). Then, a factor analysis (the Principal Component Analysis with Bonferroni rotation) was carried out to explore the relatedness of the independent variables (all nine independent variables listed above), to condense them into a smaller number of factors, based on the underlying patterns of the correlations among those variables. The sample size and the strength of inter-correlations were suitable, as recommended by Tabachnick and Fiddell (2007). The KMO value was .583, and the Bartlett's test was significant (p=.000).

The Principal Component Analysis (PCA) with Bonferroni rotation showed that only four components recorded an Eigenvalues of above 1(2.332; 1.912; 1.214 & 1.219) explaining a total variance of 72.02%. This extracted 4 orthogonal factors: Familiarity (loading on imageability = .743, age of acquisition = -.759 and familiarity = .723), Length (loading on number of syllables = .892 and phonemes = .882), and Agreement (loading on image agreement = .709 and name agreement = .498). The fourth component was visual complexity with a substantial loading only on visual complexity.

The four orthogonal factors extracted from the PCA were inserted into a multiple regression as independent variables to check their predictive power of naming latency for nouns. The model accounted for 54.9% (R^2 = .549) of the naming latency variance. The regression was significantly different from zero (F(4, 287) =84.98, p<.000). The regression analysis revealed that the Agreement factor, combining image agreement and name agreement, had the highest predictive power of naming latency (Beta=-.587, t=-14.01, p<.000). The Familiarity factor, combining imageability, age of acquisition and familiarity, was the second significant predictor of naming latency (Beta=-.487, t=-12.16, p<.000). The Length factor (syllable and phoneme numbers) did not show significant predictive power of nouns' naming latency (Beta=.065, t=1.78, ns.), nor did visual complexity.

7.3.2 Analysis of verbs only

Forty-six verbs were removed from the original set of 141 verbs: 4 verbs yielded compounds with no length data; 9 verbs with no frequency data; 33 items with name agreement less than 40%. Only 95 verbs entered the analysis. All naming latencies (trimmed) yielded by verb pictorial representations were inserted into a Pearson's correlation with the 9 independent variables described above. The initial phoneme was included in the multiple regression analysis. Table 5 shows the strength, direction and significance of these correlations.

Table 5: Pearson's correlation matrix for verbs only.

	Syllable length	Phoneme length	Frequency	Name agreement	Visual complexity	Image agreement	Age of acquisition	Imageability	Familiarity	Naming latency
Syllable length		.806**	-.148	.172	.106	.117	.116	.017	-.053	.021
Phoneme length			-.297**	.124	.089	.108	.136	.047	-.085	.032
Frequency				.187	-.163	.038	-.093	.030	.238*	-.091
Name agreement					-.109	.358**	-.268**	.431**	.027	-.595**

Visual complexity	-.134	.217*	.060	-.060	.139
Image agreement		-.369**	.421**	.087	-.602**
Age of acquisition			-.381**	.065	.456**
Imageability				.243*	-.587**
Familiarity					-.202
Naming latency					

**Significant at the 0.01 level

*Significant at the 0.05 level

There are significant correlations between verbs' naming latencies and (in descending order): image agreement; name agreement; imageability; age of acquisition. One variable showed just above significance correlation: familiarity ($r=-.202$; $p=.058$). All of these are in the expected direction. All the correlations between the independent variables correlations were in the expected direction.

The standard simultaneous multiple regression procedure was carried out to explore the predictive ability of the independent variables on naming latency. The included data met the assumptions of normally distributed residuals, homogeneity of variance and multicollinearity. The model accounted for 59.6% ($R^2 = .596$) of the verbs' naming latency variance. The regression was significantly different from zero ($F(9, 85)=14.24$, $p<.000$), suggesting that the model was appropriate for the investigated data. The regression analysis revealed that only two variables significantly predicted naming latency in descending order: Name agreement (Beta=-.425, $t= -4.86$, $p<.05$); image agreement (Beta=-.387, $t=-4.73$, $p<.05$). As in the correlation analysis, familiarity showed an effect that is just below significance (Beta=-.146, t=-1.82, p=.08). None of the other variables showed significant contribution to the naming latency of the verbs in question.

The Principal Component Analysis with Bonferroni rotation was carried out to explore the relatedness of the independent variables (all nine listed above). The sample size and the strength of intercorrelations were suitable, as recommended by Tabachnick and Fiddell (2007). The KMO value was .564, and the Bartlett's test is significant (p=.000).

The Principal Component Analysis (PCA) with Bonferroni rotation showed that four components recorded an Eigenvalues of above 1(2.224; 2.048; 1.186 & 1.074) explaining a total variance of 71.91%. This extracted 3 orthogonal factors: Familiarity (loading on frequency = .471, age of acquisition = .478 and familiarity = .801), Length (loading on number of syllables = .889 and phonemes = .923), and Agreement (loading on image agreement = .743, name agreement = .719, and Imageability = .757). The fourth Orthogonal factor contained visual complexity (.791) and Imageability (.463).

The four orthogonal factors extracted from the PCA were inserted into a multiple regression to check their predictive power of naming latency for nouns. The model accounted for 54.5% (R^2 = .545) of the naming latency variance. The regression was significantly different from zero (F(4, 90) =26.51, p<.0001). The regression analysis revealed that the Agreement factor, combining image agreement, imageability and name agreement, was the only significant predictor of verbs naming latency (Beta=-.724, t=-10.13, p=.000). The Familiarity factor, combining frequency, age of acquisition and familiarity, showed a smaller effect on verbs' naming latency (Beta=-.167, t=-2.24, p=.038). The Length (syllable and phoneme numbers) and Visual Complexity (visual complexity and imageability) orthogonal factors did not show significant predictive power of verbs' naming latency.

7.3.3 Analysis of nouns and verbs combined

The Pearson correlation, multiple regression and the Principal Component Analysis were repeated to explore if a different pattern emerges when nouns and verbs are taken together. The dependent variable was naming latencies for nouns and verbs taken together (n=387). All nine variables mentioned above were included as independent variables. The Pearson Correlation results are shown in table 6 below.

Table 6 correlation matrix of nouns and verbs combined

**Significant at the 0.01 level

	Phoneme length	Frequency	Name agreement	Visual complexity	Image agreement	Age of acquisition	Imageability	Familiarity	Naming latency combined
Syllable length	.822 **	-.126*	-.013	.119*	.066	.093	.017	-.021	.042
Phoneme length		-.173**	-.024	.119*	.069	.157**	.014	.019	.083
Frequency			.064	-.005	.035	-.078	.085	.183**	-.201**
Name agreement				-.055	.277**	-.267**	.275**	.047	-.578**
Visual complexity					-.144**	.142**	-.182**	-.119*	.189*
Image agreement						-.177**	.317**	.035	-.456**
Age of acquisition							.432**	-.393**	.465**
Imageability								.439*	-.487**
Familiarity									-.345**
Naming latency									

*Significant at the 0.05 level

There are significant correlations of naming latency of nouns and verbs combined. These correlations are: name agreement, age of acquisition, imageability, image agreement, familiarity, frequency, and visual complexity. All of these are in the expected direction. There are substantial correlations between the independent variables, for example, syllables and phonemes correlate at .822. Other notable correlations are those between imageability, familiarity and age of acquisition (all in the .31 to .44 range).

A simultaneous regression was then carried out. The regression included all the independent variables combined for nouns and verbs (NV), and the combined naming latency (NV) was set as the dependent variable. The model accounted for 58% (R^2 = .580) of the naming latency variance. The regression was significantly different from zero ($F(19, 367)=26.67$, $p<.000$). The regression analysis revealed that name agreement (NV) was the most significant predictor of naming latency (Beta=.103, t=2.41, $p<.05$), then came frequency (NV) (Beta=.109, $t(16)=2.42$, $p<.05$). The remaining variables did not show significant effects when combined: visual complexity (NV) (Beta=-.041, $t(19)=-.110$, ns); image agreement (NV) (Beta=-.046, $t(18)=-.845$, ns); age of acquisition (NV) (Beta=-.062, $t(19)=-1.32$, ns); Imageability (NV) (Beta=-.023, $t(20)=-.447$, ns); familiarity (NV) (Beta=-.011, $t(21)=-.167$, ns); Initial phoneme (Beta=-.049, $t(20)=-.479$, ns) . Word class (noun vs verb) is not a significant predictor of performance.

Syllable length (NV), phoneme length (NV), frequency (NV), name agreement (NV), visual complexity (NV), image agreement (NV), age of acquisition (NV), Imageability (NV), and familiarity (NV) were included in the Principal Components Analysis (PCA). The Kaiser-Meyer-Olkin value met the recommended value of .6 (Kaiser 1970,1974) and

Bartlett's Test of Sphericity (Bartlett 1954) reached statistical significance, supporting the factorability of the correlation matrix. The PCA with Bonferroni rotation showed that only three components recorded an Eigenvalues of above 1 (2.287; 1.884 & 1.136) explaining a total variance of 58.67%. This extracted 3 orthogonal factors: Familiarity (loading on imageability = .642, age of acquisition = -.626 and familiarity = .867), Length (loading on syllable number = .954 and phoneme number = .967), and Agreement (loading on image agreement = .780 and name agreement = .708).

In the first block, the three orthogonal factors from the NV PCA (length, familiarity and agreement) were entered. The first block (model) accounted for 50.9% (R^2 = .509) of the variance in naming latencies. The model was significantly different from zero (F (6, 380) = 65.48, p <.000). The coefficients show significant effects of the agreement (Beta=-.611, t=-16.621, p<.000) and familiarity (Beta=-.378, t=-10.102, p<.000) orthogonal factors but not length (Beta=.043, t=.791, ns.) or word class-noun vs verb-(Beta=.037, t=.549, ns.).

The second block included the three factors and word class. The model accounted for 51% (R^2 = .510) of the variance in naming latencies. The model was significantly different from zero (F(7, 379)=55.83, p<.000). None of the orthogonal factors showed significant prediction of naming latencies when word class (NV) were combined. There was no significant effect of adding these variables.

8. Discussion

The present study was carried out to establish a database of line drawings for Gulf Arabic nouns and verbs. Norms for naming latencies, name agreement, visual complexity, image agreement, imageability, age of acquisition, and familiarity were established. In addition, the database includes other intrinsic factors, such as syllable length and phoneme length. It also includes orthographic frequency values (extracted from AraLex; Boudelaa and Marslen-Wilson, 2010). This normative database is the first linguistically and culturally appropriate dataset of its kind for Gulf Arabic. The stimuli for the current database were developed to accommodate the demand for a purposely-developed normative database for both research and clinical fields within the Gulf region (e.g. Khwaileh, Mustafawi, Herbert and Howard, 2016). Linguistic and cultural appropriateness is of utmost importance to consider when developing a normative database, precision of cultural context must be maintained to ensure accuracy in data collection, and to cater to the specific linguistic and cultural contexts.

The influence of the variables in question on naming latency was examined and compared between nouns and verbs. The current findings suggest that name agreement is a significant predictor of naming latency in picture naming in healthy Gulf Arabic speakers in both nouns and verbs. This finding is in line with various studies (Bonin, Mèot, Chalard, & Fayol, 2002; Boukadi, Zouaidi & Wilson 2015, Barry et al., 1997; Lachman, Shaffer, & Hennrikus, 1974; Paivio et al., 1989; Snodgrass & Yuditsky,1996; Vitkovitch & Tyrrell, 1995); all of which have found that name agreement significantly contributes to latency in spoken picture naming. Name agreement is a robust predictor of naming latency (Alario et al , 2004); name agreement is the degree to which a noun object is named with the same term. The higher the name agreement is, the fewer competing lexical items exist for an object, which significantly influences naming accuracy and naming latency. Per Mätzig et al (2009), verbs are not as richly semantically represented and have more complex representations than nouns and are therefore more susceptible to name agreement. Furthermore, as opposed to nouns, verbs do not exist as independent objects in the world, instead, they refer to actions and states; and therefore tend to have more name agreement variance as evident from the verb name agreement results presented in this study.

The current results indicate that age of acquisition significantly influences naming latency in both nouns and verbs. This is in line with Bonin et al (2003) and Meschyan & Hernandez (2002) who found a large contribution of age of acquisition in naming speed. According to Meschyan & Hernandez (2002), words learnt at a later age have weaker lexical representations than earlier- learned words. An early explanation of the effects of age of acquisition was put forth by Brown & Watson (1987); the phonological completeness hypothesis posited that during early stages of acquisition, phonological output representations are stored in a complete form, whereas later acquired words are stored segmentally and are therefore more difficult, and take longer to assemble, causing a larger naming latency. Another interpretation of the effect of age of acquisition on verbs is that verbs have been found to be acquired later on in life than nouns as reported in Bird et al. (2001). An explanation as to why verbs are acquired later than nouns is their morphologically complex nature; verbs must undergo processes of inflection and tend to be heavily conjugated. Further, during the process of verb acquisition; generalizations are more difficult to be drawn from one verb to another (Gleitman, 1994). An example of this is inflection for tense in words such as *write/wrote/written* (Masterson et al 2008). The impact of age of acquisition on verbs has been proven to influence native speakers of other Semitic languages. Berman (2003) found that Hebrew speakers aged 3-4 were less successful at verb innovation- that is; the coinage of new verbs through identification and isolation of the consonantal skeleton (which is that of non-concatenative morphology); whereas, school-age children were able to successfully do so. This suggests that the effect of age of acquisition on naming latency of nouns is a universal phenomenon, independent from language typology.

Image agreement is a predictor of naming latency in both verbs and nouns as indicated in the present study. Words which are rated with higher image agreement are named faster than those with lower ratings (cf. Alario & Ferrand, 1999). To account for this, Barry et al (1997) found that pictures that had higher image agreement ratings had shorter latencies than those with lower ratings. Barry et al (1997) posited that image agreement influences at the level of object recognition, that is; the more accurate the stimulus is to the mental image of that object, the faster and more accurate the naming. This is because processing at this level is faster when the pictured item is close to the stored mental description.

Processing association between image agreement and name agreement was found to be present in Arabic nouns and verbs as evident from the Principal Component Analysis. This relationship amounts to the lesser competing lexical entries as opposed to a stimulus with low name agreement, which would have a larger amount of competing lexical entries, and would cause naming latency. In verb/action naming tasks, name agreement and image agreement also correlate (as found by Bonin et al., 2004; Shao et al 2013; Akinina et al., 2014); named actions that have a more uniform mental image tend to be given more uniform names; indicating that there exists a conventional image for the verb in question; so the more a verb action name is able to evoke a common mental image, the more able participants are to accurately name it. This suggests that verbs with higher image agreement and name agreement tend to have less competing lexical entries, and are therefore named more quickly and uniformly. The processing association between these two variables, can be attributed to the rich diversity in the linguistic arena in Qatar and the Gulf region. The region attracts people from all over the world including hundreds of thousands of speakers of other varieties of Arabic. Consequentially many lexical borrowings and different dialectal terms for the same words are introduced to the local varieties. The existence of various lexical items for a noun object creates competition and latency during object naming tasks. This could be one of the reasons leading the name agreement and image agreement effects found in the current data.

Imageability is also found to be a significant predictor of naming latency in nouns and verbs, too. Nouns that are highly imageable have shorter naming latency (Bonin et al, 2002). This faster reaction occurs because of the semantic richness and dual coding (visual and verbal) that highly imageable lexical items have (Akinina et al 2014). Lexical items that are highly imageable tend to be highly concrete in evoking sensory images of their referents (Del Antonio et al, 2014). Paivio (1966) found that the naming latency for image arousal was quicker for concrete nouns than abstract nouns. Verbs on the other hand, tend to have low imageability ratings per (see e.g. Eviatar, Menn & Zaidel 2014). Therefore, verbs take longer to name, (e.g. Kuaschke et al 2008) this can be explained by the semantic representation of verbs which compared to nouns; is more complex, as explained by Huttenlocher and Lui, (1979). However, despite this; verb stimuli naming latencies are influenced by the same psycholinguistic variables as nouns.

Familiarity significantly contributes to naming latencies in both nouns and verbs in the current study. Studies have found that familiarity does have an effect on latency (Snodgrass & Yuditsky 1996; Feyereisen, Van der Borght, & Seron, 1988); in the sense that the higher the familiarity of the object being presented, the shorter the latency. However, a study has questioned the reliability of familiarity rating tasks due to factors which may influence what participants may consider as familiarity (Balota et al, 2001); participants may rate items for familiarity based on their semantic meaningfulness, or the familiarity of the sub lexical spelling to sound correspondence instead of the frequency of exposure to the object in question. In the case of nouns, imageability, age of acquisition and familiarity inter-correlate, suggesting that words learned at an earlier age tend to be more imageable, and more familiar which is in line with Stadthagen-Gonzalez, & Davis (2006). As we know, nouns are learned much earlier in life than verbs (Bird et al 2001). In the case of verbs; frequency, age of acquisition and imageability correlate, this indicates that verbs which are highly imageable and are frequently used tend to be more familiar.

The processing association between familiarity and frequency in the current data could be understood under the assumption that familiarity could be a measure of spoken frequency. Previous literature assumed that word frequency correlate with word familiarity. Tanaka-Ishii and Terada (2011) define word familiarity as "the relative ease of perception attributed to every word" (p.96). However, the processes that are involved when readers rate familiarity have been a matter of dispute. Some studies interpret familiarity ratings as a measure of exposure frequency (MRC Psycholinguistic Database 2006), others view it as an underlying effect of frequency influencing perception (Segui etal. 1982; Dupoux & Mehler 1990; Marslen-Wilson 1990). In spite of this, there are studies that advocate the use of familiarity acquired through ratings is a better predictor of words processing than frequency (Gernsbacher1984; Gordon 1985; Kreuz 1987; Nusbaum et al. 1984). In their in-depth analysis of frequency and familiarity correlations, Tanaka-Ishii & Terada, (2011) report that while words with high familiarity are not necessarily frequent, words with high frequency are necessarily familiar. Their findings also suggest that familiarity ratings highly correlated to that of spoken rather than written language, which is in support of our assumption that familiarity may be an alternative measure of spoken frequency in the current data. The fact that familiarity was a more robust predictor of naming latency than frequency can be attributed to the use of orthographic (written) frequency data in the current dataset due to the lack of spoken frequency corpora for Arabic.

Visual complexity proved to only influence latency in nouns but at a very negligible level, this is in line with previous studies that have established that visual complexity in object naming does not robustly influence naming latency (e.g. Barry et al., 1997; Bonin, Chalard, Méot, & Fayol, 2002; Bonin et al., 2003; Cuetos et al., 1999; Snodgrass & Yuditsky, 1996). Visual complexity did not significantly predict latency for verbs.

Furthermore, initial phoneme, syllable and phoneme length do not significantly predict naming latency in both sets of nouns and verbs. The lack of a length effect in the present study is in line with the findings of numerous other studies with healthy speakers (e.g. Alario et al 2004; Biederman, 1987; Paivio et al., 1989; Snodgrass & Corwin, 1988; Snodgrass & Yuditsky, 1996). For the set of nouns, frequency had no significant effect, this is as in previous findings (e.g. Shao et al 2015; Bonin et al., 2004; Cuetos & Alija, 2003; Schwitter et al., 2004).

Vigliocco et al. (2011) states that the noun-verb distinction should not be evident in single word processing. The differences between nouns and verbs observed in the current study were differences in psycholinguistic variables influencing single word retrieval, in absence of any higher linguistic structures (phrases or sentences). To be able to test Vigliocco et al's (2011) claim an in-depth investigation into the differences between nouns and verbs would need to be carried out at multiple levels: single word level, phrase level, clause and sentence level.

The current dataset shows that the primary determinants of naming latency in Gulf Arabic nouns and verbs are agreement (image agreement and name agreement), familiarity (age of acquisition, imageability and familiarity) but not length (syllable and phoneme numbers). Furthermore, the current data show that familiarity (a measure of spoken word frequency, probably) is a much better predictor of naming latency than frequency values extracted from Aralex (Boudelaa and Marslen–Wilson 2010) which is based on Modern Standard Arabic written forms. There is very little evidence that naming of verbs and nouns in Gulf Arabic are affected in different ways by the 9 independent variables discussed above. Finally, the set of 319 object drawings and 141 action drawings and their norms are of principal importance for researchers and clinicians working with speakers of Gulf Arabic.

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Appendix A: The naming coding system

1. Correct: target response is produced.

1.1 Target response is produced with a different pronunciation using an alternative allophone; e.g. saying /zɪdʒɑ:rə/ for /sɪgɑ:rə/ ‘cigarette’

1.2 Correct response in Standard Arabic (SA); e.g. saying /fətɑ:/ for /bɪnt/ ‘girl’

1.3 Correct response in English; e.g. saying /kɪrtɪn/ ‘curtain’ for picture of a curtain

1.4 Alternative response: production of a response equal in meaning to the target word and can be used interchangeably; e.g. saying /ʒərɑbə/ instead of /gɑ:rɪ/ ‘Baby carriage’

2. Visual error: Production of a response visually related to the target picture; e.g. saying /bɑ:b/ ‘door’ for /dɪri:ʃə/ ‘window’

2.1 Visual error due to a visual distractor in the presented picture; e.g. saying /mʊxbə/ ‘pocket’ for a picture of ‘trousers with pockets’ or /ɣærʃæ/ ‘bottle’ instead of /jɪtfəh/ ‘to float’ for an action picture of ‘bottle floating’

3. Semantic errors: Production of a response semantically related to the target picture. This included six subcategories:

3.1. Semantic super-ordinate error: production of a semantically related error that is super-ordinate to the target response; e.g. saying /həɪwɑ:n/ ‘animal’ instead of /xərʊf/ ‘lamb’, or /jɪnaðɪf/ ‘to clean’ instead of /yəsgɪl/ ‘to polish’

3.2. Semantic coordinate error: Production of a semantically coordinate response to the target response; e.g. saying /ɣæzɑ:l/ ‘deer’ instead of /zərɑ:fæ/ ‘giraffe’, or /jɪsbæah/ ‘to swim’ for /jɪɣʊ:s/ ‘to dive’

3.3. Semantic associate error: production of a response that is associated to the target response; e.g. saying /dʊxɑ:n/ “smoke” instead of /sɪgɑ:rə/ “cigarette”, or /jɪxbɪz/ ‘to bake’ for /jɪʕdʒɪn/ ‘to knead’

3.4. Semantic circumlocution error: production of a description of the target word form rather than producing the target word form itself. This included descriptions with a minimum of one content word form; e.g. /hæg-ɪl-ʔəðɑ:fɪr/ ‘for the nails’, instead of /mɪbræd/ ‘nailfiler’

3.4.1 Sentential circumlocution: production of a complete sentence instead of producing the singular target response; e.g. saying /jæbi-jɪngɪð/ 'he wants to rescue' instead of /jɪngɪð/ 'to rescue', or /jɪhfær-ɪl-ʔærð-ʕæʃɑ:n-ɪl-zrɑ:ʕ/ 'he is digging the ground for the plants', instead of '/jɪhfær/ 'to dig'

3.4.2 Phrasal circumlocution: production of a noun/verb phrase by adding a doer/object to the target response; e.g. saying /lɑ:ʕɪb-kʊrə/ 'football player' instead of / lɑ:ʕɪb/ 'player', or /jɪʃɪd-ɪl-hæbl/ 'to pull the rope' instead of /jɪʃɪd/ or /jɪshæb/ 'to pull'

3.4.Visual circumlocution within a syntactic frame: production of a visual description of the picture in a phrase or sentence; e.g. saying /ɣærʃæ-fɪl-mɑ:j/ 'A bottle in the water' instead of /jɪtfəh/ 'to float' for an action picture of 'bottle floating', or /səfi:nə-ɣɑ:rgə/ 'A ship sinking' instead of /tæɣrɪg/ 'to sink' for an action picture of 'ship sinking'

3.5. Semantic and visual error: production of an inaccurate response that shares semantic and visual features with the target word form such as producing /leɪmʊn/ 'lemon' instead of /bʊrtʊqælə/ 'orange'.

3.6. Semantic and phonological error: Production of an inaccurate response that shared semantic and phonological (share 50% or above of the phonemes of the target response) features with the target response such as producing /hmɑ:r/ 'donkey' instead of /hsɑ:n/ 'horse'.

4 Phonological error: Production of an inaccurate response which shares 50% or more phonemes with the target response. This included two subcategories:

4.1. Phonological related real word form: when participants produced a phonological error that is a real word form, such as producing /kælb/ 'dog' instead of /gælb/ 'heart'

4.2 . Phonological related word form that is not real: when participants produced a phonological error that resulted in a word that does not exist; e.g. saying /ʕælɑ:gijæ/ for /zɪhlɑ:gijæ/ 'slide'

4.3. Phonological circumlocution within a syntactic frame: when participant describes the sounds of the target word; e.g. saying /fihæ-hærf-ɪl-gɑ:/ for the target word /wrɪgæ/ 'leaf'

5 Morpho-syntactic error: production of the target consonantal root with a morpho-syntactic error. This included six subcategories:

5.1. Inflectional error: This subcategory was scored if a participant's inaccurate response was presented with an inflectional error. This was scored if the incorrect number, gender, or person inflections were present, such as producing /məlɑːjkæ/ [plural noun] 'angels' instead of /məlɑːk/ [singular noun] 'angel', or /gətʊ/ [masculine noun] 'male cat' instead of /gətwæ/ [feminine noun] 'female cat', or /jəðrʊbæ/ 'to hit him'[3rd person]

5.2 Tense error: production of inaccurate response with a tense error in producing the target response; e.g. saying /tɑːh/ [past tense]'he fell' for /jɪtiːh/ 'to fall'

5.3 Progressive/Non-progressive error: Production of inaccurate response in a progressive/non-progressive form of the target word; e.g. saying /jɪnɑːbɪh/ [progressive] 'barking' instead of /jɪnbæh/ 'to bark', or /jɪgʕɪd/ [non-progressive] instead of /gɑːʕɪd/

5.4 Production of the target word in an incorrect form which implies an object/agent the action is being carried out with, through adding the diacritic /ʃæddæ/ ّ /; e.g. saying /jɪɣæssɪl/ 'to wash (object)' instead of /jɪɣsɪl/ 'to wash'

5.5. Derivational error: this subcategory was scored if the participant's inaccurate response was presented with a derivational error, such as producing a noun/verb/adjective derived from the same consonantal root of the target response. An example of this would be producing /mhædʒɪbæ/ [adjective] 'hair-covered' instead of /hɪdʒɑ:b/ [noun] 'hair cover', or /mʊbɑ:rəzæ/ [noun] 'Fencing' instead of /jɪbɑ:rɪz/ 'to fence' [verb]

5.6. Passivization error: production of a passivized form of the target response; e.g. saying /jɪnʃɪnɪg/ [passive] 'hanged' instead of /jɪʃnɪg/ [active] 'to hang'

6 Unrelated word form: scored if participants produced a real word form that is visually, semantically and phonologically unrelated to the target response, such as producing /dʒæhhæ/ 'watermelon' instead of /sfɪndʒæ/ 'sponge'

7 Tip of the Tongue error: this category included responses in which a participant indicated that they know the name of the object/action but have forgotten it

8 Don’t know name of object/action error : this category included responses in which a participant indicated that they recognize the object/action but do not know the name.

9 Don’t know object/action error: this category included responses in which a participant indicated that they do not recognize the object/action.

10 No Response: Failure to respond to the presented picture within 5 seconds.