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Comparing Arabic Linguistic Complexity with Other Languages in Relation to Cognitive Development

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ABSTRACT

This study examined the linguistic complexity of Arabic in morphology, semantics, and phonology, compared with other languages, and its impact on cognitive functions. Using a qualitative design and literature review method, the research draws on primary sources from Leipzig University journals and secondary sources from scholarly books, journals, and *kutub al-turāth*. Data were collected through document analysis and interpreted through reading, coding, and synthesis. The findings indicate that Arabic presents higher linguistic complexity in morphology, semantics, and phonology compared to English, German, and Hebrew. Furthermore, mastering Arabic contributes to the enhancement of cognitive functions, as its grammatical system stimulates both hemispheres of the brain. These results highlight not only the distinct linguistic structure of Arabic but also its cognitive benefits, suggesting that the study of Arabic can play a significant role in strengthening mental flexibility and intellectual capacity.

Keyword comparison; arabic linguistic, cognitive

مستخلص البحث

الغرض من هذه الدراسة هو مناقشة التعقيد اللغوي للغة العربية من جوانب علم الصرف وعلم الدلالة وعلم الأصوات بالمقارنة مع لغويات اللغات الأخرى وأثرها على الوظائف المعرفية. يستخدم هذا البحث المنهج الكيفي مع منهج الدراسة الأدبية. مصادر البيانات الأولية هي المجلات العلمية من جامعة لايبزيغ في ألمانيا، والبيانات الثانوية من الكتب/المجلات العلمية ذات الصلة والكتب المدرسية، ويتم تحليل البيانات من خلال القراءة والتحليل ووضع العلامات واستخلاص النتائج. وتظهر النتيجة الأولى أن علم اللغة العربية يحتوي على مناقشات معقدة في مجالات الصرف وعلم الدلالة وعلم الأصوات مقارنةً باللغة الإنجليزية والألمانية والعبرية، أما النتيجة الثانية فهي أن أثر إتقان اللغة العربية يتمثل في تحسين القدرات المعرفية لأن النظام النحوي العربي يدرب على التوازن بين أنشطة الدماغ الأيمن والدماغ الأيسر.

كلمات أساسية المقارنة؛ علم اللغة العربية ; المعرفية

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INTRODUCTION

Foreign languages are currently one of the skills needed, especially since the era of globalization requires everyone to have at least a general knowledge of foreign language vocabulary (Supratikno, 2021). Advances in science and technology are the main supporting factors of globalization (Mustofa, 2021). Information and communication technology has developed rapidly in various forms, the most famous of which is the development of artificial intelligence that operates with English as its programming language (Hafifah et al., 2022). In addition to technology development, foreign languages are also starting to be used by people in the economic sector, both locally and internationally. Its implementation is in naming food and beverage menus (Nawa, 2023). as evidenced by the increasing interest of the public in buying (Panggabean & Hanum, 2024).

For the global economic sector, free trade/free market requires Indonesian human resources to compete globally (Siregar, 2023). Not only English, but Mandarin also plays an important role, considering that Indonesia has bilateral relations with China in trade and tourism activities (Lianisyah et al., 2023). The importance of mastering a foreign language is not only driven by the three factors above, but several studies have shown increased creativity in individuals who master at least two languages (bilingual) (Jończyk et al., 2024). Mastery of at least two languages also helps someone affected by dementia (Van Den Noort et al., 2019) and Alzheimer's (Neveu et al., 2024) to remember the names of objects better than monolingual dementia and Alzheimer's patients. Data shows that English is the most popular world language because of its position as the international language standard in various fields.

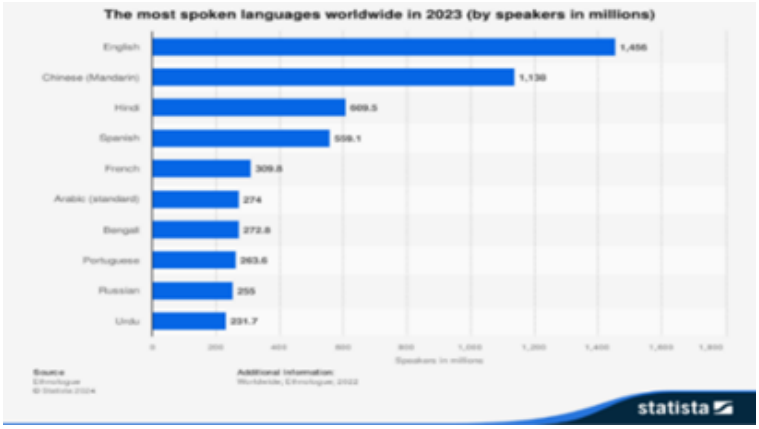

Figure 1. The percentage of the world's population that speaks various languages (Dyvik, 2023)

However, English is one of many major languages that must be learned. Arabic also occupies an important position in various studies, not just religious

studies. The University of Leipzig, Germany, released the results of a study on the influence of Arabic on the activity of the right and left brain. It found that native German speakers have strength in the interhemispheric function (dominant performance of the left brain due to the superiority of syntactic analysis), while native Arabic speakers have strength in the interhemispheric function (balance of performance of the right and left brain due to superiority in morphology, semantics, and phonology) (Wei et al., 2023).

Table 1. Morphological analysis of the Arabic language explains that each word, morpheme, letter, and harakat in Arabic has its function and can affect the semantic aspect. (Umar, 1998) Arabic has structural characteristics that distinguish it from other languages

Sentence/word	Information
المُتَعَلِّمُوْنَ نَاجِحُوْنَ	People who learn are successful
المُتَعَلِّمُوْنَ	People who study
ال	Characteristics of *isim al-ma'rifah* (words whose meaning is known)
مُ	Shows the meaning of the actor/person who
تَ+ـِ	An affix that shows the meaning of being serious about asking/looking for something. What is meant depends on the basic word. If the basic word is عَلِمَ(know) then the meaning is: serious about finding out (learning)
عَلِمَ	The root word meaning to know
وْنَ	Shows the meaning of *jama'* (plural) for men
المُتَأَلِّمُوْنَ	If the sound ع is replaced with أ then the meaning will change to "people who are hurt"

Arabic has developed since the 4th century AD until it became increasingly popular during the golden age of Islam in Baghdad when entering the 8th century. At the same time, English began its journey in the 5th century (Krinis, 2020). The compilation of Arabic grammar as a discipline (*Nahwu*) started in the 7th century, namely during the caliphate of Ali bin Abi Thalib. At the same time, English compiled its grammar in the 16th century (Ramadhan, 2020). Therefore, Arabic has started its linguistic compilation long before English (Rotatori et al., 2021).

The studies above discuss the advantages of being bilingual in cognitive aspects, some of which also show that Arabic is a superior language in terms of its historical and linguistic aspects. Therefore, this study combines the two

themes of the scientific findings above, namely explaining the complexity of Arabic as a superior second language to be learned by other speakers.

This research begins with the widespread use of foreign languages in the era of globalization in various sectors at both national and international levels, so having foreign language skills is very much needed (A. F. Siregar et al., 2024). Foreign language skills are one form of human intelligence as expressed by Gardner (1993) (Cavas & Cavas, 2020). The foreign language widely applied is English, but English is not the only superior language that must be learned. Arabic had compiled its grammatical rules long before English. Arabic linguistic studies continued to be developed until Arabic developed into a complex linguistic system (Hakami dkk., 2025).

Previous research related to this study is a comparison of Arabic and Hebrew as two languages belonging to the Semitic language family in semantic, syntactic, and grammatical aspects (Khateeb, 2023). Next is research on the comparison of Arabic and Indonesian grammar focusing on subjects, predicates, objects, and descriptions (Fitriani et al., 2023). Finally, there is research on Arabic language skills (phonology, morphology, lexicology, syntax, pragmatics) in the cognitive domain for autistic children compared to non-autistic children aged 4–11 years (Abd El-Raziq et al., 2025).

Meanwhile, this research focuses on the linguistic comparison of Arabic in the aspects of morphology (*Sharaf*), semantics (*dilalah*), and phonology (*ilmu al-ashwat*) with other languages and **examining** the impact of mastering Arabic in the cognitive realm of its speakers. Therefore, the purpose of this study is to discuss the linguistic complexity of Arabic from the aspects of morphology, semantics, and phonology in comparison with the linguistics of other languages and their impact on cognitive functions. Thus, this paper is expected to be a reference for foreign language learners in general and Arabic language learners in particular.

METHOD

This study used a qualitative approach with a library research method. Library research was conducted based on relevant information and had a clear topic. The information was obtained from several books, scientific journals, research reports, theses, and dissertations. George (2008) argues that library research systematically explores documents, literature, and information sources to obtain data on a specific theme (Sari & Asmendri, 2020). Meanwhile, Mestika Zed in (Ningsih et al., 2022) states that library research was interpreted as a

series of activities related to data collection methods, reading, researching, and processing research materials, and taking notes.

The primary data source for this study came from a journal article published at the University of Leipzig in Germany, which examined the brain function of native German and Arabic speakers. Based on this research, the researchers then had sought supporting data sources that compared Arabic grammar with other languages. Data had been collected based on relevant themes, including the linguistics of Arabic, English, German, and Hebrew. Data were additionally obtained from up-to-date and reliable sources, such as books and scientific articles. The research sources came from books, magazines, and scientific literature related to the study.

This study's area was morphology, semantics, and phonology of Arabic compared to English, German, and Hebrew. Data collection techniques were carried out by reading scientific literature sources, reviewing, marking, and drawing conclusions.

The library research steps in this study were as follows: The research stages began with reading sources related to the comparison of Arabic grammar with other languages and the impact of Arabic language acquisition on cognitive development. The next step was searching for necessary reading materials, namely international and national scientific books and journals on related topics. The next step was reviewing the reading results, marking, and drawing conclusions.

RESULTS & DISCUSSION

Arabic Morphology

One of the most prominent aspects of Arabic linguistics is morphology, commonly referred to as *Sharaf*. Arabic morphological research has attracted much attention, because one word can function as a complete sentence in English (DS et al., 2023).

Morphology is the study of the internal structure of words in a language. Word formation is examined through the root system, affixation, and pattern characteristics. The basic system of Arabic morphology is called *al-mujarrad*. *Al-mujarrad* refers to the basic letters that form words in Arabic. For example, in the word مسجد, the basic letters are سجد, while م is an affix (Salih et al., 2023).

So, *al-mujarrad* is a root system consisting of three main letters. The pattern develops from the root system by adding other letters.

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Table 2. Examples of Arabic root words and their pattern development (Haddad et al., 2023)

Pattern 4	Pattern 3	Pattern 2	Pattern 1	Root word
اِفتحْ	يفتح	فتح	فتح	فتح
اِفتَحا	يفتحان	فتحا	يفتح	
اِفتحوا	يفتحون	فتحوا	فتْح	
اِفتحي	تفتح	فتحت	فاتح	
اِفتَحا	تفتحان	فتحتا	مفتوح	
اِفتَحن	يفتحن	فتحن	اِفتحْ	
	تفتح	فتحتَ	لاتفْتح	
	تفتحان	فتحتما	مفتَح	
	تفتحون	فتحتم	مفتَح	
	تفتحين	فتحتِ	مفتاح	
	تفتحان	فتحتما		
	تفتحن	فتحتنَّ		
	اَفتح	فتحتُ		
	نفتح	فتحنا		

The root words in the table above mean "writing." Pattern 1 explains the pattern of words that change based on the *Tashrif Ishtilāḥī* classification. Pattern 2 explains the past tense verbs that change based on the subject. Pattern 3 explains the present tense verbs that change based on the subject. Pattern 4 describes the command form based on the subject. Patterns 1, 2, and **3** are called *Tashrif Lughawiy* (Haddad et al., 2023).

The term "word" (*kalimah*) in Arabic may also refer to a meaningful unit of letters. In other languages, letters have no meaning if they stand alone, for example, A/B/C. However, in Arabic, letters can contain specific meaning and function.

Table 3. Morphological analysis of Arabic words in Qur'anic verses.

Morphological Analysis					
فأعينوني: So please help me					
ي	ن	ون	عان	أ	ف
Object pronouns mean I	Nun *wiqoyah*, an affix placed before the object pronoun "I"	An affix that indicates the meaning of male plural	The root word means to help	Prefix on verbs	Conjunctions
يحسبون : They assume					
ون	ون			ون	
An affix that indicates the meaning of male plural	The basic word "assume" without any additions, then the time information refers to the past and was done by a man.			The mudloro'ah letters indicate that his gender is male.	
فجعلناهم: So We have made them					
هم	نا	جعل		ف	
The object pronoun means they are male plural'	The subject pronoun means we	The basic word "make" if without any additions, then the time information refers to the past and was done by a man.		So is a conjunction	

A word can consist of three or more morphemes. To perform morphological analysis on a word, several different attributes must be taken into account, including voice (*ashwat* /phonology), gender (*mudzakkar, muannats*), number (*mufrad, mutsanna jamā* ʿ), affixes (al-*mujarrad* and al-*mazīd*), and information about clitics (attached bound morphemes).

As for gender, words that are classified by gender in Arabic are verbs and nouns. However**,** conjunctions, prepositions, or words that have no meaning if they stand alone (the term حرف) are not categorized by gender. For the male gender, it is called *mudzakkar*; for the female gender, it is called *muannats*. *Muannats* have more specific characteristics and divisions.

Table 4. Types of muannats words with examples.

Types of muannats	Definition	Example
Muannats haqiqi	A word that indicates the female gender for something that has life	بقرة عائشة

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Types of muannats	Definition	Example
Muannats majazy	Words that indicate the female gender for something that is inanimate (something that is paired, some names of countries, the plural noun 'tasir', etc.)	لبنان، السودان أذن، عين حقوق، أيام
Muannats lafdzi	A noun that has muannats characteristics, but does not indicate female gender	معاوية
Muannats ma'nawi	A noun that does not have a muannats characteristic but indicates a female gender	مريم
Muannats ma'nawi lafdzi	A noun that has the characteristic muannats, and indicates the female gender	فاطمة حمراء

The characteristics of female gender words in Arabic often end *ta' marbuthoh* (ة), alif maqshuroh (ى/ا), alif mamdudah (اء). Still, not all of them can be confirmed as *muannats*, because they must refer to the definition above (Ahmad, 2021). As for *mudzakkar* (male) it refers to words not categorized as muannats. English has different rules regarding gender in its vocabulary, distinguishing male, female, or neutral. Words in English convey gender distinctions through lexical or contextual markers.

Table 5. Division of nouns based on gender in English.

Words	Male	Female	Suffix
Friend (neutral)	Male friend	Female friend	-
Chicken (neutral)	Rooster	hen	-
Doctor (neutral)	He is a doctor	She is a doctor	-
Act	Actor	Actress	ess

Nouns are divided based on gender; some are given a suffix (-ess) to differentiate them, some are given additional information such as male/female or he/she, and some use distinct lexical items to indicate gender (Garofalo et al., 2024). Neutral nouns in English are words that do not have a gender, such as *book*, *library*, or words without gender information, as shown in the table.

German also has a similar gender division: masculine marked with the article der, feminine with the article die, and neutral with the article das (Kretschmer, 2024). However, distinguishing gender in German can only be done by paying attention to several characteristics, so a noun's gender cannot always be identified without relying on specific endings or memorization (Hübener, 2023).

Table 6. Division of nouns based on gender (German)

Male	Female	Neutral
Der man (the man)	Das kind (a daughter)	Die Auto (a car)
Der kaffee (the coffee)	Das wasser (the water)	Die tee (the tea)

Arabic Semantics

In Arabic, semantics is known as the term *ilmu dilalah*. The scope of semantics discussion is the meaning of words in sentences (Dakhil, 2024). The designation of its meaning refers to 4 things: general meaning, specific meaning, adjectives, and verbs. The discussion of semantics on the adjective "good", for example, which in English *baik* means *good* while in Arabic good is جيد . However, the word جيد can still be developed into other word patterns.

Table 7. Differences in semantic aspects of Arabic and English

Translate	Arabic	English
Good (adjective)	جيد	Good
Kindness (good deeds)	جود	Kindness
Quality	جودة	Quality
Skills	إجادة	Proficiency
A person who has good character	جواد	Nice person
Philanthrope	جياد	Philanthrope

Arabic morphology has roots and patterns (root words and their derivatives). So words in Arabic have one root word, and other fractions will have different meanings (Shahbari-Kassem et al.2024). As in the table above, the word جيد can branch into several words with various meanings (Touahri & Mazroui, 2021). This differs from the word "good" in English, which does not have a pattern. Words related to "good" have different vocabularies.

Semantics is also closely related to syntax. Changing the order of words in a sentence can change the meaning of the sentence. Example: Andy chases Robert with Robert chases Andy. In the first sentence, Andi acts as the subject, but in the second sentence, Robert becomes the subject. Arabic can change the position of the subject and object by changing the punctuation at the end of the word, as in Qs. Fatir: 28 (اِنَّمَا يَخْشَى اللّٰهَ مِنْ عِبَادِهِ الْعُلَمٰٓؤُاۗ). The position of the subject is usually after the verb, but the word "Allah" after the verb has a *fathah* sign, so the subject in question is not "Allah" but "ulama."

Compared to German, German can shorten its sentences while still having the same meaning. For example, the sentence "Ich mache es jeden Montag" can be shortened to "Ich jeden Montag," which both mean "I do it every Monday." Based on the word order pattern, the second sentence is included in the ellipsis type of sentence because there is an omission of two word elements, namely the verb (machen: to do) and the object (es: it). Subject pronouns in German can

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replace humans, animals, objects, etc. However, after paraphrasing, the word order pattern in the second sentence is included in the declarative sentence type with a finite verb in the second position. (Purwono, 2021) . German also has a relatively free word order pattern. Therefore, this relatively free order pattern can be used as a stylistic tool, namely as a variation, the use of certain word order patterns to obtain certain effects.

Table 8. German and Arabic syntax

Verb positions in German	Position of verbs in Arabic
The verb which is located in the first position is an imperative sentence	Verbs in Arabic are connected to the subject, so they always come in front unless the subject uses a person's name, then the position can be swapped.
The verb which is located in the second position is declarative and statement sentences	
The verb which is located at the end of the subordinate clause	

Based on the table above, the position of verbs in German and Arabic is explained. The placement of verbs in German will affect the category of the sentence to be conveyed (Ackema & Neeleman, 2025), but Arabic does not have this kind of classification (Alonini, 2022).

Arabic Phonology

The difference in sound in the pronunciation of Arabic sounds can change the meaning. For example, the word والد with a long sound on the letter و has the meaning of parent/father, but if the long sound is on the letter ل so it becomes وليد then the meaning changes to a newborn baby.

Table 9. Differences in phonological aspects of Arabic and Hebrew

Phonological Aspects	Arabic	Hebrew
Alphabet	28 letters in the Arabic alphabet	22 letters in the Hebrew alphabet
Vocals	Short vowels (a, i, u) and long vowels (ā, ī, ū)	Short vowels and long p are marked by the symbol *niqqud*
Pharyngeal Consonants	There are consonants pharyngeal such as ḥ (ح), ʿ (ع)	Own a number of pharyngeal consonants, such as ḥet (ח), ʿayin (ע)
Glottal Consonants	Using glottal consonants like hamzah (ء)	Glottal consonants such as aleph (א) softer in pronunciation
Emphatic Consonants	Having consonants emphatic such as ṭ (ط), ḍ (ض), ṣ (ص), q (ق)	Modern Hebrew does not have emphatic consonants, but in the biblical form they do. some influences
Pronunciation	Pronounced with a trill (ر)	Pronounced as a uvular fricative (ר /ʁ/ in Modern Hebrew)

Consonant ' س'	Three variations of sibilant consonants: s (س), ṣ (ص), š (ש)	Two variations of sibilant consonants: s(ס), š (ש ش)
Letter Not Spoken	There are no dead letters or unpronounced letters	Some letters may not be pronounced, like aleph and he in some positions
Script System	script does not explicitly include vowels (except for harakat)	The Hebrew script uses the vowel symbol *niqqud* in sacred texts.

In more detail, Arabic phonology includes a detailed analysis of the Arabic and Hebrew phonological systems, including variations in the pronunciation of certain letters. There are pharyngeal consonants such as ḥ (ح) ʿ and ʿ (ع), and in Hebrew there are pharyngeal consonants such as ḥet (ח), ʿayin (ע). Arabic does not have silent consonants, while some letters in Hebrew can be unpronounced, such as aleph and he in some positions (Aref Abu-gweder, 2023; Swaitti & Yeshoda, 2023).

The earliest written evidence of Paleo-Hebrew is a very early version of Hebrew found in the ancient kingdom of Judah and dates to the 10th century BCE. The Tanakh (known as the Old Testament by Christians) was compiled over many centuries until the 2nd century BCE. Because it was written over such a long period, the Tanakh documents part of the evolution of the Hebrew language into various literary forms, including epic narrative, poetry, law, and prophecy, reflecting the culture and spiritual life of the ancient Israelites (GP, 2019).

To understand the relationship between Hebrew and Arabic, it is important first to understand the origins of each language. Hebrew and Arabic belong to the Semitic language family, a branch of the larger Afro-Asiatic family. Specifically, Hebrew is a Northwest Semitic language, while Arabic is considered a Central Semitic language (Nasrulloh, 2023). However, despite these differences, the origins of these languages result in some shared characteristics. Since Arabic and Hebrew are part of the same language family, their grammar often "works" in the same way. The exact details usually differ, but their grammatical systems show similarities. A very interesting example of this, and one that is very different from Persian, is the grammatical roots system (Dashti et al., 2024).

Table 10. Similarities between Arabic and Hebrew

Sentence	Modern Arabic	Modern Hebrew
I write	KataBtu is a word	Inventor KaTaVti
He wrote	KaTaBa	KaTaV Sender

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He will write	سوف يَكْتُبُ (sawfa) yaKTuBu	Author yiKHToV
He is writing	KataBtu Keywords	KoTeV Author

The table above shows that Arabic and Hebrew have the meaning "words that are similar in pronunciation but different in meaning." The first example shows that the word pattern meaning "I write" in Hebrew is interpreted as "inventor." Likewise, in example 22.34, the same word appears similar in pronunciation but differs in meaning.

For example, in Arabic, inserting -aa- between the first two consonants of the root word and -i- between the last two consonants conveys the meaning of "doing/doer of action," so that KaaTiB (كاتِب) means "writing" or "one who writes" ("writer"). → KaaTiB (كاتب) means "one who writes" (writer).

Table 11. Similarities between Arabic and Hebrew

Sentence	Modern Arabic	Modern Hebrew
I read	QaRaʾtu(The Most High)	English: KaRaʾti
He reads	QaRaʾ	KaRaʾ
He will read	سوف يقرأ(sawfa yaQRaʾu)	יקרא(yiKRAʾ)
He reading	QaRiʾ	KoRe(KoRe)

The table above explains that Arabic and Hebrew have the same root words. Both languages use the same root word for the basic verb to Read: root qr-ʾ (ق-ر-أ in Arabic, ק-ר-א in Hebrew). Despite having the same consonant root, Arabic and Hebrew distinguish vowel patterns, prefixes, and suffixes to indicate tense and subject. These similarities suggest a linguistic relationship between the two languages, although with variations in patterns due to differences in the evolution of each language and grammar (Shalhoub-Awwad & Cohen-Mimran, 2024).

This is fundamentally different from how English, Spanish, and French work. In terms of writing systems, Arabic and Hebrew use their letters to write their languages. Hebrew letters Alefbet Ivri for hebrew → Hebrew and Hijaiyah for Arabic texts. Here are the Hebrew and Arabic texts:

עִבְרִית היא שפה שמית, ממשפחת השפות האפרו-אסיאתיות, הידועה כשפתם של היהודים ושל השומרונים, אשר ניב מודרני שלה (עברית ישראלית) הוא שפתה הרשמית של מדינת ישראל, מעמד שעוגן בשנת 2018 בחוק יסוד: ישראל – מדינת הלאום של העם היהודי

اللُّغَة العَرَبِيّة هي أكثر اللغات تحدثاً ونطقاً ضمن مجموعة اللغات السامية، وإحدى أكثر اللغات انتشاراً في العالم، يتحدثها أكثر من ٤٦٧ مليون نسمة، ويتوزع متحدثوها في الوطن العربي، بالإضافة إلى العديد من المناطق الأخرى المجاورة كالأحواز وتركيا وتشاد ومالي والسنغال وإرتيريا وإثيوبيا وجنوب السودان وإيران. اللغة العربية ذات أهمية قصوى لدى المسلمين، فهي عندهم لغة مقدسة إذ أنها لغة القرآن، وهي لغة الصلاة وأساسية في القيام بالعديد من العبادات والشعائر الإسلامية.

Both readings are read from right to left. Although they look different, Hebrew and Arabic letters are actually descendants of the same letter, namely the Phoenician letter (Wahyu et al., 2021). Not only that, even Hebrew letters have a one-to-one correspondence with Arabic letters. This means that for every Hebrew letter, there is an equivalent in Arabic letters. Arabic and Hebrew have so many differences that native speakers of both languages cannot form mutual understanding in interlingual communication, unlike us Indonesians who can communicate with Malaysians, because we are of the same stock. However, behind all that, there are several similarities that we can observe from both languages in terms of some vocabulary, pronunciation, and letter writing systems that show that both come from the same ancestor language, the Semitic language (Adamczyk, 2019).

The Impact of Arabic Language Mastery on Cognitive Functions

The rich and systematic morphology and semantics of Arabic are important studies. This uniqueness distinguishes Arabic words from Indo-European languages, including German. Recent research has released an analysis of neural correlations in Arabic language processing that mostly occurs in the brain's left hemisphere (Abou-Ghazaleh et al. 2020). In addition to morphological aspects, Arabic semantics have also been shown to activate the superior temporal gyrus in both brain hemispheres (right and left hemispheres).

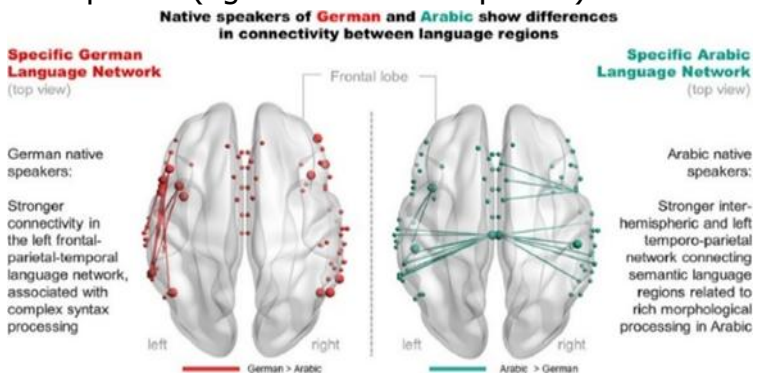

Figure 2. Brains of native German and Arabic speakers

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Brain regions of German and Arabic native speakers. German speakers have strength in intrahemispheric activity, namely language processing that occurs in the same hemisphere of the brain. Stronger in the left temporo parietal network related to syntactic aspects. While the brain of Arabic speakers is stronger in interhemispheric activity, namely language processing that occurs in both hemispheres of the brain that connects semantic aspects and rich morphological processing of Arabic (Wei et al. 2023). Word processing in Arabic operates in root and pattern units. Word roots mainly provide core semantic meaning, and word patterns express phonological information, morphosyntactic information, and phonological structure of surface forms (Haboussi et al., 2025).

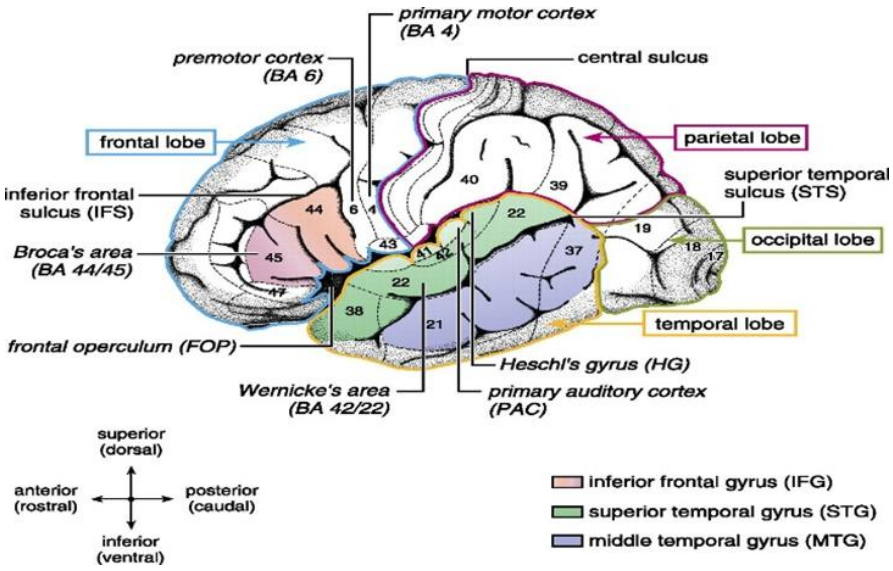

Figure 3. Left and Right brain parts

Arabic language communication requires processes that facilitate the integration of these different aspects. Many views suggest that cortices relevant to lexical processing include the STG/STS, MTG, and upramarginal gyrus (SMG) in the rostral inferior parietal lobe (IPL), as well as the ventral language pathway connecting the left temporal lobe and the pars triangularis in the inferior frontal gyrus (IFG) (Matar et al., 2019). The lexical variety in Arabic demands the performance of the bilateral dorsal prefrontal cortex and posterior parietal cortex to be more rigorous (Liang et al., 2024). It is known that Arabic has a wealth of homonyms such as the word راس which can be interpreted as head, leader, or "the most" and polysemies such as أهل which can be interpreted as family or expert.

The cognitive studies mentioned above provide an overview of the complexity of Arabic grammar, as evidenced by comparative research on the brains of native Arabic speakers and native German speakers. To reinforce these findings, researchers also conducted linguistic comparisons between Arabic and other languages such as German, English, and Hebrew. This comparative study

does not aim to elevate or diminish a language as a cultural identity, but rather presents scientific findings whose application is optional. Based on the results of scientific research, Arabic possesses linguistic advantages that can enhance the brain performance of foreign language learners compared to learning other languages.

CONCLUSIONS

Arabic has a linguistic structure that enables bilingual speakers to develop higher metalinguistic awareness and enhance the ability to analyze language meaning in detail. Mastery of Arabic can activate both brain hemispheres more equally than other languages. Stronger interhemispheric activity among Arabic speakers, especially in morphological and semantic processing, supports the claim that Arabic can maximally improve the quality of cognitive function. This aligns with findings from various neurological studies that state that mastery of a foreign language (especially a complex language like Arabic) can strengthen cognitive function. This study requires further investigation on Arabic linguistics. The recommendation that researchers can give for further research is to examine the brain performance of Arabic language learners compared with foreign speakers using Functional Magnetic Resonance Imaging (fMRI) technology. The recommendation for future research is to conduct a comparison of linguistic aspects in Arabic literature with literature from other languages, in order to broaden the scope of comparison as outlined in the main focus of this study.

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