



## Phonemes Activating Visual Perception When Reading Three Domsday Chapters of the Holy Qur'an

الحروف الصوتية التي تحفز الإدراك البصري عند قراءة ثلاث سور  
ليوم القيامة في القرآن الكريم

Alawiya W. I. Al-Siyami

د/ علوية وان إبراهيم السيامي

Assistant professor of linguistics Department of English, College of the Social Science, Umm Al-Qura University

أستاذ مساعد في اللغويات قسم اللغة الإنجليزية، كلية العلوم  
الاجتماعية جامعة أم القرى

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### الملخص

تهدف الدراسة الحالية إلى استكشاف الحروف الصوتية المكونة لثلاث سور من القرآن الكريم، وذلك بغرض تحديد التأثيرات الصوتية اللغوية لمختلف أنواعها وتكرارها بما يجذب الإدراك الحسي لما في النص. وكانت الفرضية أن الإدراك البصري ينشأ من استخدام أنماط مميزة لأجزاء من الكلام تشترك في صفات صوتية معينة ومعاني صوتية. وقد أظهرت البيانات أن البنية اللغوية قد اتبعت شبكة متباينة لفئات صوتية محددة لبروزها في للوظائف التشكيلية ذات المعنى الصوتي. ولوحظ أن فئة من الحروف الصوتية ذات صفة الهمس كانت سائدة ومتنوعة لما لها من تأثير في استحثاث الإدراك البصري عند تكوينها لكلمات النصوص ذات الصبغة الوصفية. وأشار التباين في تكرار استخدام الحروف التي كانت في طليعة ثمان من أكثر الحروف ظهرت في تكوين نظم العروض في هذه النصوص وفي تكوين مورفيمات المفردات وارتباطها بدلالات الاصوات بما يتسق بمعنى النصوص. ويأمل البحث بأن يؤدي إدراك هذه الوحدات الصوتية المكونة لسباق السور إلى إعطاء القراءة تصوراً جديداً.

الكلمات المفتاحية: علم الأصوات المعرفي، الإدراك البصري، آيات القرآن، يوم القيامة، القراءة، الحروف الصوتية

### Abstract

The present study intends to explore the phonemes that activate visual perception in reading three chapters of the Holy Quran. The aim is to incorporate the usage-based approach in phonological analysis of more contextually informed measures. The premise is that visual perception emerges out of distinctive usage patterns of parts of speech that share distinctive phonemic categories and sound meaning. The data demonstrated the linguistic structure of the chapters followed a scheme of contrastive network of specific phonemic categories that were salient for morphemic functions and sound-meaning associations. It was observed that the scheme was induced from the dominance of the voiceless category in forming content words that reiterated the descriptive type of these texts. The phonemic properties of this category led to visual perception. The variation of frequencies indicated the usage of top phonemes for prosodic features, morphemic functions, and sound-symbolism association. It is hoped that realizing the minute units composing the context of the chapters gives reading a new perception.

**Key words:** cognitive phonology, visual perceptions, Qur'an verses, the Resurrection day, reading speech, phonemic categories.

It is recorded from ibn Omar (may Allah be pleased with them both) that the prophet of Allah, Muhammad (PBUH) stated that "Whoever wants to see the Qiyamah with his eyes should read 'when the sun wraps its rays', and 'when

the sky breaks apart', and 'when the sky split.' Related by Al-Tirmidhi (3333).

### Introduction

The quoted statement above presented a very

strong proposition that has been supported by research from different filed of linguistics. Namely, it stated the role of reading to collaborate a number of the highest cognitive processes such as detecting the differences between letters or words, recognition of the phono-grapheme relationship, and ultimately comprehension (Baker and Brown, 1984; Tylor and Tylor, 1990; Van den Broek, 1994; Sadoski, Goetz, and Fritz, 1993).

Studies in cognitive phonology have established the recognition of phonemes in prompting speech perception of reading (LaBerge & Samuels 1974, McCandliss, Cohen, and Dehaene 2013); operating in the initial processes of categorizing and schematizing linguistic information (Langacker 1988; Tylor, 2002; Nathan, 2006); storing of information unit (Bybee 1985, 1994, 2001); providing explanations for the speech behavior of a disorder patient's speech (Ball, 2003); and manipulating behaviors (Cuskley 2013, Pogacar, Plant, Rosulek, and Kouril, 2015, Kawahara, Noto, and Kumagai, 2016). These studies have experienced the actual usage of phonemes in different tasks and indicated the effect of frequency in perception and activating mental sensory representations.

Other studies have argued for the emergence of categorical effects in cognition. Mody, Studert-Kennedy, and Bradly (1997) related categorical effects of phonemes on reading. Bybee (2006, 2010) also acknowledged distinctive categories of phonemes to operate higher cognitive processes that influence the use and development of linguistic structure. However, Bybee (2006: 71) determined that they are not as important as the frequency of phonemes in use. The frequency of use indicates the schemes that these phonemes are based on their distribution in the lexicon (Bybee, 2001). The entrenchment of information as exemplified in words and morphemes ensured their storage and process as one chunk that is relevance to other lexical associations of similar phonological or semantic intersection (Bybee, 1994, 1985).

These studies entail the affect of phonemes in activating cognitive processes of conceptualizing, conventionalizing, and perceptualizing. However, Bybee (1985) strongly emphasizes the effect of phonemes relevant to frequency of use in usage-based approach. For Bybee, the approach

strengthens linguistic structures in memory and activates other cognitive processes via frequency in the interaction of phonemic representations and meaning, which is modified in language use (Bybee, 1994: 293-295).

The present study adopts the base-used phonology of Bybee (2001). It explores the cross phonological effects in three chapters of the Holy Qur'an (81, 82, 84) focusing on "patterns of use" and the system by which they "affect" the cognitive representation of language (Bybee, 2010; 12) and thus conceptualize the situation. Its premise is that visual perception in the annotated chapters emerges out of distinctive usage patterns of parts of speech that share distinctive phonemic categories and sound meaning.

Accordingly, the major aim of the study is to incorporate this usage-based approach in phonological analysis of more contextually informed measures. The aim is thus threefold; 1. Identify the dominant categorical phonemes and distinctive features in terms of manner and voicing features, 2. Rank their order of frequency of occurrence and mark their sensual perceptions that interact with speech, and 3. Relate phonemic categorical effects and frequency to the sensual speech perception of the discourse.

By employing the usage-base, the study analyzes the parts of speech composing each chapter to derive the organized network of connections based on word-specific patterns of articulation and/or semantic overlap (Bybee, 2010). The impact of related forms in the network is classified into syntactic categories (content and function words) and phonemic categories (manner of articulation MA, place of articulation PA, and voicing).

As Bybee (2001: 26) indicated the impact of similar or identical features to vary between them, the proposed phonemic categories correlate the referents of the words or derivational and inflectional forms in the lexical use. The phonemic effects are expected to activate sensual (audio-visual) perceptions via semantic properties relevant to salient frequencies and sound-meaning perspective of sound symbolism (Swadesh, 1971; Morton, 1994; Klink, 2000; Lowrey and Shrum, 2007; Coulter and Coulter, 2010; Klink and Wu, 2013; Cuskley, 2013; Pogacar, Plant, Rosulek, and Kouril, 2014). The effect of fre-

quency is perceived in determining the dominate phonemic category in the context of Doomsday in the three chapters.

Analyzing phonemes in actual usage of a highly authentic text, the study hops to contribute to the knowledge of speech perception and pathologies for the advantage of learning language and enlighten the mechanism of sensual perception that hopefully assess effective reading.

The study is organized as follows. Section 2 defines visual perception that can be activated throughout reading. Section 3 briefly describes the context and the different categories of lexical representations that interact with the visual perception of the discourse. Section 4 represents the analysis. Section 5 is the discussion. And, section 6 is the conclusion.

### Visual perception in reading

The relevance of visual perception to reading begins with what stimulates the senses to detect the small pieces of information. Usually, it is directed to differentiate written letters, words, font type, figures, colors, and punctuation marks. Interest in visual perception by phonemes has emphasized perceiving written letters as sound-code, clues to words meaning, and context (LaBerge & Samuels 1974, McCandliss, Cohen, & Dehaene, 2013; Schuster, Hawelka, Hutzler, Kronbichler, Richlan, 2016).

However, the fact that one word-form may compose different phonemes and follow phonotactic rules, the perception of phonemes-grapheme determines scheme formation that characterizes words in the context of use (Bybee, 2010). As visual perception is drawn to colors and large fonts, the emancipation of phonemes in reading can be drawn to acoustic features of phonemes that are distributed within the lexis.

Acoustic features and sound properties make phonemes easily recognized, especially obstruent consonants. Their production engages cognitive processes that involve recognizing differences and similarities of manner and place of articulations. Nathan (1989) indicated that sonorant consonants, unlike obstruents, are relatively recognized with voice and loudness that cannot be categorized cognitively.

Within the obstruent category, the perception of voiceless plosives is mostly distinguished from

any other plosives (Lieberman et. al., 1952). The manner of airflow determines an instant burst that prompts ears to be audibly perceived. Different manners and voicing features determine different places of articulation. Phonemes involve pro front articulators are visually perceived at the labial or the dentals, or sensibly recognized within the anterior, at the alveolar or the palatal. Back phonemes are sensible audially by the tongue movements and strong frequency of airflow at the velar, uvular, and pharyngeal, or involve the glottis in their production.

Speech studies have observed acoustic modifications in speech intelligibility and advocated the impact of phonemic categories. They suggested that the acoustic features of consonants and amplification of intensity were motivated in association with vowel intensity in the temporal envelope of speech (Cuskley, 2016; Pogacart, et.al., 2015; Kawahara, et. al., 2016) and consonant-type effects were evident in defining lexical decision (Scarborough and Zellou, 2013) and improving word-recognition (Montgomery and Edge, 1988). The amount and type of acoustical distortion were reported to affect lexical decision (Saripella, Loizou, Thibodeau, and Alford, 2011; Fogerty, Montgomery, and Crass 2014) or speech decoding (Lieberman, Cooper, Shankweiler, & Studdert-Kennedy, 1967).

Phonemes were related to perception of semantic information that interact with cognitive, social, or sensory factors. Klink (2000) reported that the sudden stop of plosives has hard impact upon hearing and was perceived with large size, heaviness, and more masculine whereas the smooth and continuous of fricatives led to perceiving nonwords with small size, lightness, fastness, and more feminine. Voiceless phonemes were perceived to activate meanings of sharpness, arcuate, and spiky attributes, whereas voiced phonemes were associated with heaviness and strength of evolution (D'Onofrio, 2014; Cuskley 2013, and Kawaha et al. 2017). As for the sonorants, the liquids were associate with sliding as the airstream glides through, rotating, and the nasals were associated with resonance (Swadesh, 1971).

In short, the perception of phonemes is a wealth of information that contributes in effective reading. Adopting the use-based approach in the cur-

rent study, the phonemes composing the linguistic structures of the three chapters are expected to generate visual and audio perceptions. They show specific words and patterns of articulations that reiterate the theme of the context. The next section probes into the scheme that the reader can perceive from the properties of phonemes and frequency counts relevant to the linguistic structure of the chapters.

### The linguistic context of the Doomsday

The chapters included in this study are known as Makkan chapters. Except for 84, both 81 and 82 were successive. However, this spatial distance kept these chapters strongly bonded from different perspectives.

The three chapters are all about one-page size. The verses range between 19 to 29, all of which share similar size-structure. The major theme, as stated by the prophet's saying, is describing the scenes as apparent on the forthcoming Doomsday. However, like all Makkan chapters of the holy Qur'an, they also propose Tawheed (Unity of Allah), His All Mighty Power, righteous deeds, and the Resurrection for rewarding (heaven) or punishment (hell).

All these themes are displayed in three parts that are separated by linguistic boundaries in the discursive context of the chapters. The first part describes the collapse of the universe. This part is salient by verses initiated constantly with the adverbial of time 'ithaa إذًا 'when' and ends with the third-person singular female pronouns -t suffixing every verb. However, this common style also marks differences among the three chapters. Chapter 81 is more elaborative in describing the scenes than 82 and 84.

The end of the first part exhibits the end of picture scanning for the reader. It is marked by the intervention of verse 14 in 81, 5 in 82, and 6 in 84. These verses change the grammatical referent from the anaphoric reference of -t that is represented by [t] to the use of the second person pronoun -k that is represented by [k] you/your in 84 and 82. Verse 6 of 82 and 84 begin with the phrase that carries the meaning O' mankind. However, anaphoric reference of [t] changed to be cataphoric and refers to mankind as 'a soul' in verse 14 of 81. There is also the interrogative

form in 81 (verse 26) that brings about the interrogative form in 82 (verse 6) and that of 84 (verse 20). These grammatical changes contribute in activating visual perception and stimulate awareness from environments to prospecting inside and hold account of oneself.

The third part of the theme describes the Resurrection day and sets the scene of rewarding/punishing the believers/disbelievers. It is represented by the vivid implicatures of the words Jannat 'heaven' and jaheem 'hell' in 81; al-abraar 'the righteous', al-fujjaar 'the wicked', and na'eem 'pleasure' in 82; and thubuura 'destruction', sa'eera 'blaze', aamanu 'believers', kafaru 'disbelievers', and ajr 'reward' in 84. These words are strongly connected to the theme.

The linguistic structure in the context of Doomsday.

The three chapters consisted of 322 words: 116 were in 81, 87 were in 82, and 119 were in 84. These words showed two syntactic categories: the lexical (content words) and the non-lexical (functional words). Most of these words exhibit a phrase structure in occurrence. They are either prefixed or suffixed with inflectional/derivational morphemes.

The definite article al is represented by the phonemes /l/ and recognized as the moon and the sun al that prefixed nouns and adjectives (al-djibaa, ashshams in 81). It is recognized as a bound preposition prefixing nouns (le-rabbihaa 'to its Lord' in 84) or a functional word (la-fee in 82). The suffix -uun that is represented by the phoneme /n/ indicates present tense of the attached verb and a sound-plural male subject pronoun (yaclam-uun, yasdjud-uun). The prefix ya- that is represented by the phoneme /j/ indicated a singular-male subject when attached to verb and marked its present tense.

Functional words exhibit independent morphemes as the preposition fee 'in' and ila 'to' or the connector wa 'and'; all of which consist of [n l w] phonemes. They also exhibit cases of bound morphemes as the possessive pronoun -hu (rabbihu) and -ka (rabbaka) or a combination of a preposition and a pronoun (feehaa). All these variations were considered belonging to part of speech (table 1).

**Table 1:** Content and functional words composing the three chapters

Chapters	Lexical categories		Total
Content words 81	Nouns	ash-shamsu/ an-nudjuumu/ al-djibaalu/ al-cishaaru/ al-wuHuushu/ al-biHaaru/ al-maw'uudatu/ dhanbin/ aS-Suhufu/ as-samaa'u/ al-djannatu/ al-djaHeemu/ an-nufuusu/ nafsun/ bil-khunnas/ al-layli/ aS-Subhi/ la-qawlu/ rasuulin/ al-carshi/ SaaHibukum/ bil-'ufiqi/ al-ghaybi/ bi-Daneen/ bi-qawli/ shayTaanin/ dhikrun/ lil-caalameen/ al-Laahu/ al-caalameen	30
	Verbs	Kuw-wirat/ inkadarat- suy-yirat/ cuT-Tilat/ Hushirat/ sudj-djirat/ zuw-widjat/ su'ilat/ qutilat/ nushirat/ kushiTat/ suc-cirat/ 'uzlifat/ calimat/ 'aHDarat/ 'uqsimu/ cascasc/ tanaf-faas/ ra'aahu/ tadhhabuun/ shaa'a/ yastaqem/ tashaa'uuna/ yashaa'a	24
	Adjectives	al-djawaari/ al-kunnas/ kareem/ dhi (2)/ al-mubeen/ radjeem/ rabbu	8
Functional words 81	'dhaa (14)/ wa (18)/ maa (5)/ 'ayyu/ laa/ 'nnahu/ cinda/ tham-ma/ laqad/ huwa (3)/ cala/ fa-'ayna/ 'in/ 'illa/ li-man/ min-kum/ 'an (2)		54
			116
Content words 82	Nouns	As-samaa'u/ al-kawaakibu/ al-biHaaru/ al-qubuuru/ nafsun (2)/ 'insaanu/ rabbika/ Suuratin/ bid-deen/ la-HaafeZeen/ al-'abraara/ naceem/ al-fudjaara/ djaHeem/ yawma/ ad-deen/ bi-ghaa'ibeen/ yawmu (3)/ ad-deen (2)/ li-nafsin/ shay'an/ al-'amru/ lil-Laah	27
	Verbs	infaTarat/ intatharat/ fudj-djirat/ bucthirat/ calimat/ qad-damat/ 'akh-kharat/ ghar-raka/ khalaqaka/ fasaw-waaka/ facadalak/ shaa'a/ rak-kabak/ tukadh-dhibuuna/ yaclamuuna/ tafcaluun/ yaSlawnaha/ 'adraaka (2)/ tamliku	20
	Adjectives	al-kareem/ kiraaman/ kaatibeen	3
Functional words 82	'dhaa (4)/ wa (9)/ maa (9)/ yaa'ayyu/ fee/ 'ayyi/ kal-laa/ bal/ 'inna (3)/ calaykum/ lafee/ hum/ canhaa/ thum-ma/ laa/ yawma'idhin		37
			87
Content Words 84	Nouns	As-samaa'u/ rab-bihaa (2)/ al-'arDu/ al-'insaanu/ kaadiHun/ kadHan/ famulaaqeeh/ kitaabahu (2)/ bi-yameenihi/ Hisaabun/ 'ahlihi (2)/ Zahrihi/ thubuura/ saceera/ ba-Seera/ bish-shafaq/ al-layli/ al-qamari/ Tabaqan/ Tabaq/ al-Qraanu/ al-Laahu/ bi-cadhaabin/ aS-SaaliHaat/ 'adjrun/ mamnuun	29
	Verbs	inshaq-qat/ 'adhinat (2)/ Huqqat (2)/ mud-dat/ 'alqat/ takhal-lat/ 'uutiya/ yu-Haasabu/ yan-qalibu/ yaSlaa/ yad-cuu/ kaana (2)/ Zan-na/ yaHuur/ 'uqsimu/ wasaq/ 'it-tasq/ la-tarkabun-na/ yu'minuun/ yas-djubuun/ kafaru/ yu-kadh-dhibuun/ 'aclamu/ yu-cuun/ fa-bash-shirhum/ 'aamanu/ camilu	30
	Adjectives	yaseera/ masruura/ 'aleem/ ghayra	4
	Adverbs	masruura	1
Functional words 84	'dhaa (4)/ wa (14)/ maa (7)/ feehaa/ yaa'ayyuha/ 'innaka/ 'ila (2)/ fa-'amma/ man (2)/ can/ 'amma/ 'innahu (2)/ fasawfa (2)/ fee/ 'an/ lan/ bal-laa/ 'inna/ bihi/ fa-laa/ laa (2)/ bimaa/ caly-humu/ balil-ladheen/ 'illa/ al-ladheena (2)/ lahum		55
			119

The dominance of noun phrases is evident in the table, which reiterated the descriptive type of texts and determined the engagement of all senses when reading. Of the 98 noun phrases 16 were repeated in different variations. as-samaa 'sky' and Allaah occurred across the three chapters. nafs 'soul' occurred once in 81 but were repeated 3 times in 82. al-'insaan 'mankind' occurred in 84 and 82. albihaar 'seas' and Jaheem 'hell' occurred in 82 and 81, al-layl in 81 and 84

yawma 'the day' was repeated in 81, and masruura in 84. Verbs showed repetition too. calimat occurred in 81 and 82. 'adraaka was repeated in 82. These content words exhibited repetition of derived forms

The plural form nufuus and the singular form nafs in 81 and 82 and the verb ta-naffas in 81 are derivationally relevant, and so do calemat in 81 and 82 and 'clamu in 84. tukadh-dhebuun in 82 and yukadh-dhebuun in 84. wasaq and ittasaq in

84, and shaa'a, tashaa'uuna, yashaa'a in 81 are also derivationally linked.

The shared features are perceived to connect the chapters with a network of semantic relation relevant to the theme.

Systematic semantic interrelations are observed among members of content words. The nouns exhibited two types of referents: objects on top, in the sky, and those down, on earth. Objects that directly referred to the sun, souls, pages of records, far-sweeping star, and twilight denoted perceptible referents from the environment (sun, stars, sky, seas, tombs, mountains, etc.) or conceptual referents (Satan, hell, heaven, deeds, rewards, punishment, etc.). These referents are factually distinctive for the magnitude of size and shapes. The direct relation of referents activated visual perception of their locations in the environment and represented the focal point of awareness. These nouns exhibited contrastive semantic relations as hyponyms ('arD, qubuur, djibaal, bihaar, etc) and antonym (assamaa' and 'arD, annudjuum and al-kawaakib, etc.).

The nouns exhibited categories of inherited properties and connotative meanings. The sunlight is well recognized for the vitality of life and the stars and the endless sky have been fascinating human beings by their mysteries. The referred objects connoted lightness and heaviness of structure or far and proximal of distance. Meronym and hyponyms relations are perceived between the sun, stars, planets, the moon, and the sky or the mountains, seas, tombs, and the earth. Furthermore, antonymy is evident between high rising molecules in the sky and heaviness and massive materials on earth, or between the stars and the planets, mountains, and seas, etc.

These relations are exemplars of the whole-part semantic components that activate visual perception of natural surroundings. It identifies the distribution of information in the context that started from the physical phenomena up in the sky down to earth and from the surroundings of the environment down to the specific ego and the responsibility of mankind.

The verb phrases included 74 verbs and 1 adverb. They marked semantic relations relevant to time. Those that described the destruction of the universe exhibited the grammatical concept of past and shared a pattern of passive form.

Concealing the agent in this context of mystical explosions sequentially stimulated cognitive conception relevant to the context of the chapters. This linguistic pattern signifies the initial part of the chapters.

Motion verbs were evident with gemination (suuyirat, zuwwidjat, cuTTilat, muddat, etc.). This gemination implicated bouncing or extending movement. Such verbs were associated with subjects of heavy and massive molecule (al-djibaaalu, annufuusu, al-cishaaru, al-'arD).

Verbs in present tense mark a shift of theme from previous past experiences to determine immediate and current act-responses on part of mankind. The implicature of tadhabuun 'are going', tamliku 'possesses', yu'menuun 'believe', and yasdjuduun 'prostrate to Allah', etc. reiterated the meanings of these verbs relevant to the context. The association of singular/plural subjects and verbs of different tenses were perceived in statements, open questions, negations, and condemning-phrases structures. This variation activated cognitive processes of conceptualizing, conventionalizing, and emancipation of these grammatical structures relevant to the context while reading the chapters.

Functional words apparent in table 1 showed less variety than content words. 19 of the 60 functional words were excessively occurred within and across the chapters. They exhibited another systematic network of connection. These words recognized different grammatical functions and thus activated different perceptions.

The sensibility of the referents for materialistic features or attributes of size and proximity and the associated acts of different tense implicatures activated not only pleasant scenes but also regrets and conceptualization of urgent compensation for the current and future situations. The referents and linguistic structures were perceptually enough to motivate conscious awareness.

Analyzing the syntactic categories of table 1 revealed 945 consonant-phonemes. They represented the frequency of occurrence for 28 Arabic consonant-phonemes. However, each chapter was different in utilizing them. 27 phonemes operated in 81, 26 in 82, and 27 in 84 (table 2).

**Table 2:** consonant frequency of use in the three chapters

	81	82	84			
	f	m	f	m	f	m
ʔ	32	3.38	20	2.11	30	3.16
b	12	1.27	13	1.37	25	2.64
t	23	2.43	11	1.16	16	1.69
θ	1	.11	3	.32	1	.11
dʒ	9	.95	5	.52	2	.21
ħ	9	.95	4	.42	8	.84
x	1	.11	3	.32	0	0
d	6	.63	13	1.37	5	.53
ð	19	2	7	.74	11	1.16
r	18	1.95	17	1.79	19	2
z	2	.21	0	0	0	0
s	16	1.69	7	.74	15	1.58
ʃ	12	1.27	2	.21	6	.63
ʂ	5	.53	2	.21	4	.42
ḍ	2	.21	0	0	1	.11
ṭ	4	.42	1	.11	2	.21
ḍ	0	0	1	.11	2	.21
ʕ	12	1.27	8	.84	8	.84
ʁ	1	.11	2	.21	2	.21
f	6	.63	12	1.27	9	.95
q	7	.74	3	.32	15	1.58
k	8	.84	18	1.90	10	1.05
l	38	4	23	2.43	35	3.69
m	24	2.53	17	1.79	31	3.27
n	35	3.69	27	2.84	41	4.32
h	7	.74	6	.63	21	2.22
w	28	2.95	12	1.27	17	1.79
j	7	.74	14	1.48	16	1.69

At first glance, table 2 shows a scheme of frequency that relates the phonemes of each chapter together. The highest frequency is scored by [n l] across the three chapters

The lowest frequency is scored by [z]. Between the highest and lowest, a range of overlapping frequencies that bonds the spaced 84 together with 82 and 81 is observed. [ʕ] has the exact frequency in 84 and 82, and so does [ʁ]. [ħ] links 82 to 81, and so does [b]. [θ] links 84 to 81. Other counts showed similar frequencies that connects 84 to 81 [d ḍ ʂ], 84 to 82 [b h], and 82 to 81 [ṭ ḍ]. These frequencies represented their occurrence in forming the syntactic categories of the chapters.

Although the lowest frequencies of [ð ḍ z] linked the chapters too as /ð/ connected 84 to 82 and /ḍ/ linked 84 to 81, they also marked chapter-spe-

cific features as [z] occurred in 81 only. These phonemes exhibited distinctive occurrence in the form of three syntactic categories: [ḍ] consisted the verb aHDarat ‘brought’ and the adjective Daneen ‘withholder’ in 81 and the noun ‘arD ‘earth’ in 84, [z] formed the verbs zuwwejat ‘paired’ and uzlefat ‘brought near’ in 81, and [ð] formed the noun HaafiZeen ‘keeper’ in 82 and the verb Zanna ‘thought’ in 84. Interestingly, they were in association with phonemes of high frequencies [n ʔ t]. The characteristic features of these phonemes and position in word-form contributed to the perception of the words they formed.

These phonemes represented two natural sound-categories: obstruent and sonorants. Their variation of frequencies marked top 8 phonemes in rank order (table 3).

**Table 3:** Rank the order of the phonemes.

Rank order	1	2	3	4	5	6	7	8	9	10	11	12	13	14
	n	l	ʔ	m	w	r	b	t	s	ʃ	ð	k	h	f
Freq.	103	96	82	72	57	54	50	50	38	37	37	36	34	29

  

Rank order	15	16	17	18	19	20	21	22	23	24	25	26	27	28
	ʕ	q	d	ħ	ʃ	dʒ	ʂ	ʔ	ʁ	θ	x	ḍ	ð	z
Freq.	28	25	24	20	20	16	11	7	5	4	4	3	3	2

The frequencies reflected distinctive properties of place and manner of articulations. They related members of phonemes to larger categories. The high frequency of /n/ represents the nasal category that includes /m/. /l/ represents the approximants of which /j r w/ are included. /ʔ/ represents the voiceless plosive of which /t k q/ are included. However, /b/ represents the voiced plosive of which /d/ is included. Within MA category, phonemes are also identified by properties of voice and strength of airflow. /t ʔ s ħ f q h ʃ k ṭ x θ ʂ/ are recognized as voiceless obstruents and /dʒ ʁ d z ð ḍ ḍ / are voiced.

As for PA, the top ranked /n/ recognizes the frontal articulatory phonemes of which the dental-alveolar /l r t z ð ḍ d s ʂ/ are included. /b/ recognizes the labial /f m/ to be included. /j/ recognizes the palatals /dʒ ʃ/ to be included. And, /ð/ recognizes the dentals /ð θ/ to be included. Whereas the high frequency of /ʔ/ recognizes the back-articulatory phoneme of which the glottis /h/ is included, /w/ recognizes the velar /k/ to be included, /q/ recognizes the uvular /x ʁ/ to be included, and /ħ/ recognizes the pharyngeals /ʕ/ to be included.

Evidently, the low frequencies of some members as /x δ đ ʎ/ were recognized by members of relevant categories. Each phoneme shares or differs from another to indicate a category. /θ/ and /ʎ/ share the same frequency of use and cat-

egorized as fricatives. Yet, they contrast in voicing and PA. Likewise, /đ/ and /δ/ share similar frequencies and voicing category but differ in MA and PA (table 4).

**Table 4:** Categories of different phonemic properties and their frequencies

		Labial	Dental	Dental-Alveolar	Palatal	Velar	Uvular	Pharyngeal	Glottal	
Plosive	Voiceless			t 50 t̥ 7		k 36	q 25		ʔ 82	274 (28.88)
	Voiced	b 50		d 24 đ 3						
Fricative	Voiceless	f 29	θ 5	s 38 ṣ 11	ʃ 20		x 4	ħ 20	h 34	235 (24.87)
	Voiced		ð 37	z 2 ð 3			ʎ 4	ʕ 28		
Affricate	Voiceless									16 (1.69)
	Voiced				dʒ 16					
Nasal		m 72		n 103						176 (18.62)
Approximant	Liquids			l 96 r 54						150 (16.43)
	Glides				j 37	w 57				94 (9.95)
Total	151 (15.98)	42 (4.44)	391 (41.16)	73 (7.72)	93 (9.84)	33 (3.49)	48 (5.08)	116 (21.16)	947	

The dominance of frontal phonemes (655. %69.31) over the back phonemes (290. %30.69) is evident. The high frequency of this category is consistent with words activated visual perception (shams, djibaal, samaa, khunnas, etc.). Whereas, non-visualized referents determined the usage of front/back phonemes of auditory perception (Tabaq, shayTaan, kawaakib, etc.) or verbs denoting light movement but harsh (qutilat, Hushirat, succirat, infaTarat, huqqat, etc.). These words accentuated specific phonemic categories that emancipated the syntactic categories and sound-meaning relations.

Most of back phonemes showed the association of the frontal vowels [i], but that was not considered in this study. Except for nouns that referred to light high object, the majority determined conceptualizing the two categories and recognizing the different degrees of acoustic frequencies when reading.

The dominance of the plosive category (266.

%28.15) among the other members is also evident. The affricate was the least (16. %1.69). However, the dominance of voiceless phonemes is indisputable. As they determined aspiration that vary in strength according to position in word-structure and phonemic category, the variety of voiceless members determined different conceptualizing and perception. The category distinguished plosive-fortes [ʔ k t] and plosive-emphatics [q t̥] that scored %20.32 and fricative-emphatics [ṣ] and fricative-strident [s ʃ] that scored %7.32 all of which auditorily contributed to the effect of the category.

The elevation of voiceless plosives, emphatics, and/or fortes activated auditory and sensual perception for VOT. This was observed with [ʔ] at verse-initial and [t] at the other end of the verses. The physiological feature of aspiration determined their occurrence frequently in the form of most content words. The dominance of this category reiterated that perception is mostly ef-



fective in cognition with voiceless plosive from any other sounds even within the same category (Taylor, 2002).

The high frequencies of these phonemes led to the perception of other phonemes that were recognized for strong auditory perception. In Arabic, uvulars and emphatics are well recognized for length in duration and high in frequency as they determine the rotation of the tongue root (Al-Ani, 1975; Zawaydeh, 1997; Khattab et.al. 2006).

With a count of 353 (%37.35), these phonemes indicated that every word in the syntactic categories of table 1 will include at least one of these phonemes that characterize the scheme of word-forms. Words denoting heavy molecules were perceived to contain voiced obstruents (djibaa, nudjuum, djannat, ghayb, etc.) in contrast to those that denoted light molecules that contained voiceless obstruents (shayTan, samaa', SuHuf, wuHuush, nafs, etc.). The combination of voiced and voiceless phonemes implicated an extent degree of perception to sharpness or hardness (maw'uudatu, cishaaru, 'arD, qubuur, biHaar, etc.). The inclusion of voiced plosive in word-forms were less frequent than the voiced (5).

**Table 5:** Frequency and types of phonemes composing the syntactic categories

Syntactic categories	Obstruents	Sonorants					
Content words		Voiceless	Voiced	Nasals	Liquid	Glides	
Noun phrase		127	77	74	81	14	373
Verb phrase		153	51	39	41	22	306
Functional words		79	40	57	28	58	262
Total		359	168	170	150	94	941

Table 5 shows that voiceless obstruents exceeded in forming content words despite of the fact that [n] scored the highest frequency (table 3). Words consisting of mere voiced phonemes were not frequently occurred in line with the theme of the context (table 6).

Table 6 illustrates that most content words consisted of a larger set of obstruent phonemes. Although sonorant-nasals [n m] and sonorant-approximants [l w j] consisted functional words, they frequently occurred in content word-forms too. This interchanging occurrence of different phonemic categories and frequencies not only

determined perceiving similarities and differences but also reaffirmed the interactive scheme of connected network.

The high frequency of [ʔ] is perceived in its occurrence for forming the adverbial of time at initial position of every verse in the first part of the chapters. This frequency was associated with the front vowel [i] and thus reiterated the front articulatory properties. The high frequency of [t] identifies its position bounding to verbs, and so do [s f ħ].

**Table 6:** Voiced phonemes composing the syntactic categories

Content words	Functional words	
Noun phrase	Verb phrase	
an-nudjuumu/ dhanbin/ al-layli/ al-ghaybi/ bi-Daneen/ / al-caalameen/ lil-caalameen/ al-djawaari/ dhi (2)/ al-mubeen/ radjeem/ rabbu/ yawma/ ad-deen/ bi-ghaa'ibeen/ yawmu (3)/ ad-deen (2)/ bid-deen/ naceem/ bi-cadhaabin/ al-layli/ mamnuun/ ghayra	yu-cuun/ yad-cuu/ Zan-na/ camilu	wa (41)/ maa (21)/ cinda/ cala/ li-man/ bal/ laa/ man (2)/ can/ lan/ bal-laa/ laa (2)/ bimaal/ balil-ladheen/ al-ladheena (2)
Phonemes types		
n ɖ b ð l ʔ r d ʕ w j ɗ ð m	m n l ð d ʕ j	n b ð l d ʕ w m

The dominance of content words (373) described scenes of explosions that are massive and yet mute fast and yet sharp-turns, far and yet approximant, spread upward/downward, or acts that are heavy and yet sharp and intentional and yet regretting. These images were activated by specific phonemic categories that exhibited contrastive articulatory properties and stimulated auditory and visual sensual perceptions of properties. They also exhibited large-specific and contrastive relations in line with that of semantic and syntactic categories. In short, the phonemes composing the syntactic categories of the three chapters activated perception and attentive conceptualization. The next section endeavors into the frequency of use of phonemic categories and relates occurrence to the theme of the three chapters.

## The visual perception in the context of the Doomsday

The previous sections demonstrated different phonemic categories and frequencies of occurrence that identified interactive perceptions of shared and different features. According to Taylor (2002), identifying members of shared features in a category indicated a scheme network. The scheme stipulated the formation of perceptual network that cognitively contrasted. This was observed in the prevalence of lexical categories over functional categories, noun-phrase category over the others, denotative and meronym semantic relations over connotative and hyponym relations.

The words constituting the syntactic categories signified the inclusion of phonemes that interacted with the contextual information. Visualizing referents on earth was associated with voiced obstruents with/without voiceless obstruent (al-djibaal, al-cishaaru, albihaaru, etc) but far and unseen objects were associated with voiceless obstruents (suHuf, wuHuushu, shams). Visualizing the universal destruction was associated with sequence of plosive [t] ending verbs and verses of each chapter.

Recognizing the phonemic categories that composed these words activated knowledge about syntactic categories and conceptualized the articulated word relevant to the context. They determined the stability of relations between phonemic properties and word-forms. Bybee (2001: 26) indicated that 'the strength of association between items with identical or similar features may vary according to the number and nature of the features...' This strength of relation was observed in the data. Lexical and non-lexical categories exhibited the prevalence of the voiceless category as the emerging scheme of the context.

The frequency of use accentuated the scheme with salient prosodic properties, morphemic function, and sound-symbol associations. The frequency of [t] and [n] identified [t] rhyming at the initial part of the chapters and [n] towards the end. The frequency of [ʔ] identified alliteration at the beginning of the verses and the consonance of specific phonemes [s ʃ k q h] in the middle of the chapters.

These prosodic properties not only maintain the entertaining and amusing purpose, but also as-

sisted conceptualizing morphemic and syntactic information. The rhyme of [t] represents the repetition of the inflection -t suffixing verbs in past tense and the anaphoric subject reference to singular female pronoun it (kuwwerat, infatarat, inshaqqat, etc.). However, the inflection -t is perceived differently when it is positioned at verb-initials. It gives the meaning of present tense and refers to the third-person singular female pronoun she (tanaffas) or the second-person plural male pronoun you (tafcaluun, tukaththibuun, tathhabuun, etc.).

The rhyme of [n] represents the inflection -uun that determines verbs in present tense and the sound-plural male pronoun. It was evident in six instances of tadhabuun in 81, tafcaluun in 82, and yasjuduun, yukaththibuun, yu'minuun, yucuun in 84. Other instances of rhyme exhibited [n] as a phonemic component of nouns and adjectives.

The consonance of [k], [s], [h], and [q] activated syntactic and morphemic information about the attached words differently. [k] and [q] exhibited proximal sequences of consonance in 82 and 84, but [s] was in 81. The consonance of [q] identified speech events (huqqat, 'ittasaq, quri'a, etc.) and object (qamar, shafaq wasaq, etc.). However, the consonance of [k] and [h] identified functional and content words. [k] represents the second-person singular pronoun you and the possessive pronoun your, suffixing lexical and non-lexical categories particularly in 82. Whereas, [h] represented the third-person singular subject-male pronoun he and the possessive pronoun his, particularly in 84.

The alliteration of [ʔ] led to conceive the presence of the repeated adverbial time 'itha. Other voiceless onstruents of provoking frequencies [s ʃ h] have identified their association of lexical or non-lexical categories and phonemic or morphemic functions.

Prosodic properties were observed as consonance of the sonorants [m l r j] and the alliteration of [w] that represents the independent compounding [wa]'and'. The consonance of [l] led to visualize its presence with noun phrases as the definite article al, [j] suffixed verbs to give the meaning of present tense y-, and [m] intervened the rhyme of [n] at verse-final or formed consonance by composing grammatical words

(inna, min, hum, etc.). In this category, [r] was exceptional. It identified its occurrence in verb-forms (kuwwirat, suyyirat, inkadarat, etc.) and objects (al-cishaaru, al-biHaaru, al-qamar, etc.) but never with functional words in this context. The occurrence of these phonemes in prosodic usages have clearly cued to the perception of the syntactic categories (Morgan, Shi, and Allopena, 1996). They have identified their associates as content and functional categories.

Whether phonemic or morphemic representations, obstruent or sonorant, the prosodic features of the verses they have exhibited phonemes that are well recognized in sound-meaning associations. They stimulated visual and auditory perceptions relevant to the context. Symbols of spiky stinging shapes, lightness swiftness movement, softness, small cramming space, etc. are symbols associated with voiceless phonemes (Swadesh, 1971; Morton, 1994; Klink, 2000; Lowrey and Shrum, 2007; Kovic, et. al., 2010; Cuskley, 2013). Whereas, softness and resonance are distinctive symbols of nasal (Swadesh, 1971).

These symbols were perceptually observed in words referring to wrapping the spiky sharp sun-rays in kuwwirat as symbolized by [k] and [t], the light movement of the mountain in suyyerat or fire-flames in su'irat as symbolized by [s] and [t], the closed small zone were reflected in the cramming of wild beasts in wuhooshu husherat as symbolized by [h] and [ʃ], the burial-alive of a baby-girl in qutilat as symbolized by [q] and [t], the sharp edges of falling ripping pieces of the sky in inshaqqat and infatarat as symbolized by [ʃ], [q], and [t], etc. The sequence of [t] at verb-finals reiterated the symbolic meaning of remote massive but muffled explosions and the harsh action of killing in qutilat consisted of the strong emphatic plosive [q] and twice [t].

Lightness and remoteness were perceived relevant to speech objects as ash-shamsu, samaa'u, suHufu, etc. containing [ʃ h f s]. The symbol associating these voiceless fricatives are in line with that of sound symbolism studies (Swadesh, 1971; Morton, 1994; Klink, 2000; Lowrey and Shrum, 2007; Cuskley, 2013). The phonemic feature of sibilant and strident [ʃ s] exhibited their effect in defining motion to be more intense and thickness in friction as observed in the

words composing them. Considering that this phonemic category dominated in the context of the three chapters, perceiving such symbols was activated and reiterated by the frequency of occurrence.

Evidently, reading the verses determined perception of phonemic categories that activated cognitive processes of conceptualizing. However, these processes were stimulated from conventionalized surroundings of the environments. The phonemic categories stimulated audio and visual sensations from defined morphemic functions and prosodic properties that recognized the words based on their distribution in the context. The interaction of phonemic categories and frequency accentuated the scheme that organized the linguistic structure of the chapters in line with the theme. This interactive network activated conceptualizing morphemic or phonemic stored knowledge that Bybee (1994, 2001) indicated, related their entities in the position of the presented lexical items. The autonomy of each phoneme is derived from the inherited meaning of the syntactic category and phonemic features. Although they are conventionalized when reading, grammaticizing of meaning is not possible.

## Conclusion

In reading the verses, this naturally occurring speech determined recognition of phonemes and signified the inclusion of phonemes to interact with contextual information. The major aim of the study was to explore the phonemes activating visual perceptions when reading the three chapters (81, 82, 84). The premise was that they followed a scheme of phonemic category in line with the theme of Doomsday. Analyzing the syntactic categories of the chapters, the phonemes demonstrated contrastive network scheme that was constant with the linguistic information designing the context. It was evident that phonemic properties of manner, place, and voicing features worked as prominent cues from which the scheme was deduced and identified it emerging of voiceless phonemes.

These phonemes represented lexical connections based upon phonemic or semantic overlap. The phoneme/b/, for example, was perceived as a voiced, labial, plosive, and emphatic phoneme. Its usage led to perceive other categories to which it was attached as functional (bihi, bi-'yyi),

content-verb (bash-shirhum), or content-noun (al-qubuuru). However, this multi realizations preserved the phonemes from being grammaticized with specific granted meaning.

The top ranked eight phonemes /n l ʔ m w r b t/ consisted every morpheme or functional/content word composing the three chapters. The least in frequency /z δ/ consisted only content words and specified the chapters (81 and 84) but were associate with at least one of these dominant phonemes. Recognizing these phonemes in reading, whether as words or morphemic functions, confirmed cognitive processes of recalling and relating stored knowledge, audio-visual perceptions of outer/inner conditions, and conceptualizing the expected response. It is the first step in speech perception for reading (LaBerge & Samuels, 1974).

The highest degree of correlation between phonemic category and the theme of Doomsday was perpetuated by the voiceless obstruents /ʔ q k h h x t t s s ʃ f θ/. They consisted most content words, especially nouns that referred to real objects of the environment. Sequences of voiceless emphatic plosives [ʔ q k t t] at verb-final activated images of mute explosions that sharply flashed and enigmatic in line with the articulatory features and sound-symbolism association of these phonemes. Likewise, the voiceless fricative sibilants [ʃ s ʃ] or lenis [h h x f θ] reiterated the tense, rapid, and light motions of these events in line with their articulatory features and sound-symbolism associations.

The frequency effect anticipated in perceiving the usage of top phonemes in audio perception as represented by salient prosodic properties and visual perception as represented by sound-symbol associations. It activated a network of connected symbols and referents or sequence of events. The variation of members and frequency of occurrence gave the colors and stand-out features that attracted attention which, as Cavanagh (1992) indicated, is the last step in perception and the gateway to memory.

The finding of the study supported Bybee's (2001) phonemic scheme and frequency effect in entrenching linguistic information and linking the phonological morphological forms of the lexicon in the network. However, this study showed that the effect of phonemic categories

and the frequency of occurrence as phonemic component or morphemic function released the repeated phonemes from being automated as one unit.

### Limitation and research opportunities

The study is pioneer in incorporating phonological analysis of more contextual informed measures and authentic text as the Holy Quran. exploring sensual perceptions when reading three chapters of the Holy Quran. However, focusing on consonant-phonemes limited the perspective of perception. The effect of frontal/back vowels in association with consonants of different MA or PA were hardly toughed. It can be elaborated in another research. Moreover, the frequency of occurrence and associated sound symbolism of vowels and numbers or types of syllables might be investigated concerning sensual perceptions.

One might examine the relevance of the proposed phonemic category to other types of narrative texts. Exploring the findings of this study or the inclusion of other phonemes in chapter 75 that carries the title of Doomsday or comparing the frequency of voiceless plosives among these chapters are promising topics. Generally, exploring difference in phonemic characteristics among higher forms of speech categories is a promising area for future research.

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## Online resources

<https://www.youtube.com/watch?v=E-ZLaQQ5Uil>

<https://www.youtube.com/watch?v=pEyK0kem-C7U&t=1115s>

<https://www.youtube.com/watch?v=6IH45W1uAGk>

<https://qurancomplex.gov.sa/kfgqpc-quran-translate-english/>

<https://surahquran.com/tafsir-ibn-kathir/altafsir.html>