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Sound Symbolism and Conceptual Perception: An Experimental Study Based on English Synonym Sets and Kazakh Basic Semantic Concepts

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Abstract—**The main aim of the study is to experimentally identify the cognitive perception characteristics of English synonyms corresponding to basic concepts in Kazakh (big–small, sharp–round, dark–light, heavy–light, fast–slow) and to determine their relationship with phonological and semantic factors. Although issues of sound symbolism and prototypicality have been widely studied in global linguistics, these phenomena have not yet been systematically analyzed in the consciousness of Kazakh-speaking respondents on the basis of English lexis. In this respect, the study addresses a relevant research problem in cognitive linguistics and comparative semantics. The experiment involved 67 Kazakh-speaking participants aged 18 and above. Data were collected via the Google Forms platform using the semantic differential method. For each Kazakh concept, four English synonyms were presented, and their degree of correspondence was evaluated on a 5-point Likert scale. The data were processed in the R statistical environment using non-parametric statistical methods (Friedman and Wilcoxon tests with Bonferroni correction). The results revealed the presence of a clear prototypical center for many concepts. In particular, the words big, small, dark, easy, heavy, fast, and slow were perceived as core prototypes, while other synonyms demonstrated peripheral characteristics. For some concepts, the prototypical structure appeared weak or multicentric. Although the symbolic influence of vowels was partially observed, it was not identified as a decisive factor. The findings demonstrate the complex interaction between sound symbolism and prototype theory and provide a theoretical basis for further research.**

Index Terms—**sound symbolism, prototype theory, cognitive linguistics, English, Kazakh**

I. Introduction

Iconicity (or imagery) refers to the non-arbitrary relationship between the form of a word or sound and its meaning. In the early stages of linguistic research, the relationship between sound and concept was considered unmotivated, that is, arbitrary (Khassenov, 2021; Khassenov et al., 2026). This view was particularly shaped within the framework of structuralism. The Swiss linguist Ferdinand de Saussure argued that there is no natural connection between the two sides

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of the linguistic sign (sound and meaning), and that their relationship is conventional (Saussure, 1999). However, recent studies in cognitive science have demonstrated that non-arbitrary patterns in the lexicon are substantial and have begun to investigate the mechanisms underlying their emergence (Dingemanse, 2015).

One of the earliest systematic demonstrations of the relationship between sound and shape is the maluma–takete experiment, later known as the bouba–kiki effect (Sapir, 1929; Ramachandran & Hubbard, 2001). In matching tasks, participants consistently associate pseudowords such as bouba or maluma with round or soft shapes, and words like kiki or takete with sharp or angular shapes (Fort & Schwartz, 2022). Research suggests that these correspondences are shaped by sensory and motor experiences (Ngai et al., 2024), indicating a natural, cross-cultural link between conceptual meaning and visual perception.

Recent cross-linguistic studies have demonstrated stable associations between concepts and forms within size-related sound symbolism. For example, research has shown persistent, language-independent associations between certain sounds and meanings (Blasi, 2016); systematic patterns linking word meanings with shapes (Sidhu, 2025); manifestations of size symbolism in infant-directed speech (Laing, 2025); the role of articulatory movement in identifying iconicity between sound and meaning (Imai, 2025); emotional coronal alternations in Mapudungun (Molineaux, 2025); and sound iconicity in Spanish emotion words (Calvillo-Torres, 2025), among others.

With regard to English lexicon-specific studies, researchers have shown that large objects and animals tend to be associated with low back vowels and "heavy" sounds (a, o, u), whereas small objects are more often linked to high front vowels (i) (Winter & Perlman, 2021). Other studies highlight onomatopoeia as a widespread iconic mechanism in the phonological structure of English (de Varda & Marelli, 2025); the historical forms of 784 English words as indicators of iconicity (Monaghan & Roberts, 2021); the perception of imitative words in English according to degrees of iconicity (Tkacheva et al., 2021); analysis of nouns through the maluma–takete effect (Sidhu, 2021); general sound symbolism in English (Blake, 2017; Svantesson, 2017); and comparative studies of sound symbolism in English-speaking children and Japanese (Kantartzis et al., 2011).

The aim of the present study is to identify the correspondence between lexical units expressing various semantic concepts in Kazakh and multiple English synonym sets.

II. Method

A. Participants

A total of 67 respondents representing different age groups participated in the study. The participants were distributed across the following age categories: 18–25, 26–40, 41–60, and 61 years and older. All respondents were in satisfactory health, had normal vision and hearing, and were fluent speakers of the Kazakh language.

No restrictions were imposed based on gender, ethnicity, or social status. However, several mandatory inclusion criteria were applied:

1. absence of visual impairments;
2. intact color perception (no color vision deficiency);
3. ability to accurately perceive and interpret the meanings of sounds and words in Kazakh.

Participation in the study was voluntary. Prior to the experiment, all participants were fully informed about the purpose and procedures of the study, and the experimental tasks were administered only after informed consent had been obtained.

B. Materials

The research materials consisted of 10 Kazakh adjectives forming five antonymic pairs: big/small, sharp/round, dark/light, heavy/light, fast/slow. These lexemes were selected based on the principle of semantic opposition and were chosen as the study sample due to the clarity of their semantic fields and expressive properties. The words were treated as isolated lexical units and analyzed independently from phonetic and semantic perspectives.

In addition, to determine the English equivalents of the selected Kazakh concepts, a set of four English synonyms was compiled for each adjective. In total, the study included 40 English lexical items. Specifically, the following synonym sets were used:

big: large, big, huge, massive
small: small, minor, tiny, petite
sharp: sharp, acute, keen, intense
round: round, circle, circular, spherical
dark: dark, dusky, murky, obscure
light (bright): light, bright, illuminated, vivid
heavy: tough, hard, heavy, burdensome
light (easy): soft, mild, easy, gentle
fast: fast, prompt, quick, brisk
slow: slow, sluggish, lagging, lethargic

These synonym sets were designed to capture variability within semantic fields and to enable a comparative analysis of potential symbolic correspondences between Kazakh and English concepts.

The equivalence between the Kazakh concepts and their English synonym sets was established through a triangulation procedure based on three authoritative dictionaries (Oxford, Cambridge, and Merriam-Webster) and semantic overlap analysis. Only those English items whose core denotative meaning directly corresponded to the Kazakh concepts were included in the study. Synonyms with primarily figurative, culturally bound, or context-restricted meanings were excluded to ensure conceptual consistency across languages.

C. Procedure

The experimental study was conducted online using the Google Forms platform. Participants were provided with a detailed explanation of the study's aim, procedure, and instructions, and informed voluntary consent was obtained prior to participation. At the beginning of the experiment, the following instruction was presented:

> "The purpose of this experiment is to determine, on a scale, the degree to which several English synonyms (e.g., big, large, huge, massive) correspond in your perception to basic concepts (e.g., big).
>
> You will be presented with several semantic categories, such as big, small, dark, and light. Each category contains four English synonyms (e.g., light, simple, airy, soft). Your task is to rate how well each word corresponds to the given concept on a scale from 1 to 5.
>
> 1 – Does not correspond at all
> 2 – Weak correspondence
> 3 – Moderate correspondence
> 4 – Good correspondence
> 5 – Complete and accurate correspondence
>
> There are no right or wrong answers in this study. Each rating should reflect your individual perception and intuitive associations".

An example was provided:

> Which word best corresponds to the meaning "big"?
> - Large: 1–2–3–4–5
> - Big: 1–2–3–4–5
> - Huge: 1–2–3–4–5
> - Massive: 1–2–3–4–5

Participants were presented with 40 English synonym words related to the five Kazakh antonymic pairs in random order. In each task, a specific Kazakh concept (big, small, sharp, round, dark, light, heavy, light, fast, slow) and the phonetic transcription of four English synonyms were provided. Participants were asked to evaluate, using the semantic differential method, which word was more strongly associated with the given concept in terms of meaning and sound.

For example:

> "Big" – large: 2
> "Small" – tiny: 4
> "Light" – bright: 3
> "Heavy" – tough: 5

Each word–concept pair was rated on a scale from 1 to 5. All responses were automatically recorded in the Google Forms database and subsequently exported for statistical analysis.

D. Data Analysis

The analysis was based on participants' ratings of the synonyms for each concept using a 5-point Likert scale. Since each respondent evaluated multiple synonyms within the same conceptual category, the data followed a repeated-measures design. This structure required the use of non-parametric statistical methods.

To determine whether there were overall statistical differences among the synonyms within each concept, the Friedman analysis of variance by ranks (Friedman test) was applied. This test is suitable for comparing multiple conditions (synonyms) evaluated by the same group of participants and is appropriate for ordinal data. The Friedman test allowed for an assessment of the internal structure of each synonym set.

When the Friedman test revealed a significant overall effect, pairwise comparisons were conducted using the Wilcoxon signed-rank test to identify which specific synonyms differed from one another. This test compares paired ratings provided by the same participant and is fully compatible with a repeated-measures design. To reduce the risk of Type I error in multiple comparisons, the Bonferroni correction was applied. Adjusted p-values (p_adj) were used to assess statistical significance at the level of $p\_adj < 0.05$.

The results of the pairwise comparisons were used to determine the prototypical status of the synonyms within each concept. Words that showed statistically higher and significantly different ratings compared to other synonyms were interpreted as forming the prototypical core of the concept. Synonyms with lower ratings or without significant differences were interpreted as belonging to the peripheral layer of the conceptual category.

All statistical analyses were performed using R version 4.5.2 (https://cran.r-project.org/). Throughout the analysis, the assumptions of non-parametric methods were strictly observed, and the results were interpreted within the theoretical frameworks of prototype theory and sound symbolism in cognitive linguistics.

III. Results

A. Statistical and Semantic Analysis of the Concept "Big" (Kazakh "Ulken")

The concept "big" was examined through four English synonyms: big, huge, large, and massive. The study employed a repeated-measures design: each respondent rated the degree to which each of the four words corresponded to the concept "big" on a 1–5 Likert scale. Given that this design relies on within-participant comparisons, the use of non-parametric methods was deemed appropriate.

First, the Friedman test was applied to determine whether there were overall differences among the synonyms. When a significant effect was found, pairwise comparisons were conducted using the Wilcoxon signed-rank test with Bonferroni correction to identify which specific pairs differed.

Table 1
Wilcoxon Pairwise Comparison Results for the Concept "BIG"

Comparison	W	p_adj
Big – Huge	1773	< .001
Big – Large	1348	< .001
Big – Massive	1106	< .001
Huge – Large	236	0.158
Huge – Massive	380	1.000
Large – Massive	660	1.000

The pairwise results show that big differs significantly from all other synonyms:

Big – Huge: p_adj = 0.000000103
Big – Large: p_adj = 0.00000565
Big – Massive: p_adj = 0.0000044

These findings indicate that big was rated significantly higher than the other three words in representing the concept "big".

By contrast, no significant differences were observed among huge, large, and massive:

Huge – Large: p_adj = 0.158
Huge – Massive: p_adj = 1.000
Large – Massive: p_adj = 1.000

Thus, these three synonyms are perceived at a comparable level, occupying the same semantic layer in respondents' cognition.

big: M = 4.01, SD = 1.31, Med = 5
large: M = 2.81, SD = 1.27, Med = 3
huge: M = 2.45, SD = 1.13, Med = 2
massive: M = 2.69, SD = 1.43, Med = 2

Descriptive statistics showed that the synonym big received the highest mean rating (M = 4.01, SD = 1.31), followed by large (M = 2.81, SD = 1.27), massive (M = 2.69, SD = 1.43), and huge (M = 2.45, SD = 1.13). The median ratings (Med_big = 5; Med_large = 3; Med_massive = 2; Med_huge = 2) confirm the clear prototypical status of big.

Overall, the results demonstrate that the concept "big" exhibits a clear prototypical structure. Within this structure, big functions as the basic prototype, while huge, large, and massive are shifted toward the peripheral zones of the category.

This hierarchy fully accords with the principles of prototype theory in cognitive linguistics, according to which the center of a category is occupied by the most frequent, semantically broad, and stylistically neutral linguistic unit, whereas other members are perceived as semantically modified variants.

The initial hypothesis of the study assumed that the symbolic effect of vowels might influence the perception of the concept "big". In this respect, the results suggest a partial effect of phonological factors, but not a decisive one.

From a phonological perspective, big is monosyllabic, short, and contains the short front vowel /ɪ/, making it articulatorily "light." In contrast, huge and massive are polysyllabic, articulatorily more complex, and phonetically "heavy".

According to sound symbolism theory, open back vowels are often hypothesized to correlate with meanings of largeness. However, the empirical data here indicate that phonological complexity does not enhance prototypicality; rather, a simple phonological form appears to reinforce cognitive centrality.

The prototypical status of big is primarily explained by its semantic generality, stylistic neutrality, and high frequency in everyday usage. By contrast, huge and massive convey intensifying meanings such as "very big" or "extremely large." Such semantic strengthening narrows and specifies the concept, distancing these words from the central category core.

The statistical analysis of the concept "big" allows the following conclusions:

1. Big is the clear prototype of the concept "big".
2. Huge, large, and massive are near-prototypical but non-central, peripheral units.
3. The symbolic influence of vowels is indirect rather than direct for this concept.
4. Semantic generality and lexical frequency play a more important role in determining prototypicality than phonological factors.

In sum, the results reveal a clearly defined prototypical structure for the concept "big": big serves as the basic and denotative synonym, while huge, large, and massive occupy peripheral positions. Although sound symbolism was expected to influence size perception, the findings indicate that semantic generality and lexical frequency are decisive in determining prototypicality.

B. Statistical and Semantic Analysis of the Concept "Small" (Kazakh "Kishi")

The concept "small" was examined through four English synonyms: small, minor, tiny, and petite. Each respondent rated the degree to which these four words corresponded to the concept "small" on a 1–5 Likert scale. The study employed a repeated-measures design, meaning that each participant comparatively evaluated all synonyms. Accordingly, non-parametric statistical methods were applied.

Overall differences were assessed using the Friedman test, and when significant effects were detected, pairwise differences among the synonyms were examined using the Wilcoxon signed-rank test with Bonferroni correction (Table 2).

TABLE 2
WILCOXON PAIRWISE COMPARISON RESULTS FOR THE CONCEPT "SMALL"

Comparison	W	p_adj
Minor – Petite	366	0.201
Minor – Small	204	< .001
Minor – Tiny	468	1.000
Petite – Small	410	0.023
Petite – Tiny	658	1.000
Small – Tiny	1358	< .001

The pairwise comparisons indicate the following significant differences:

Small – Minor: p_adj = 0.0000103
Small – Tiny: p_adj = 0.000518
Petite – Small: p_adj = 0.023

These results show that small differs significantly from minor, tiny, and petite.

No significant differences were found between the following pairs:

Minor – Petite (p_adj = 0.201)
Minor – Tiny (p_adj = 1.000)
Petite – Tiny (p_adj = 1.000)

Thus, minor, tiny, and petite are perceived as closely related and occupy a similar level in respondents' cognitive representations.

small: M = 3.72, SD = 1.43, Med = 4
minor: M = 2.19, SD = 1.15, Med = 2
tiny: M = 2.69, SD = 1.34, Med = 3
petite: M = 2.52, SD = 1.33, Med = 2

Descriptive statistics showed that small received the highest mean rating (M = 3.72, SD = 1.43), followed by tiny (M = 2.69, SD = 1.34), petite (M = 2.52, SD = 1.33), and minor (M = 2.19, SD = 1.15). The median values (Med_small = 4; Med_tiny = 3; Med_petite = 2; Med_minor = 2) confirm the prototypical status of small.

The findings demonstrate that the concept "small" also has a clear prototypical structure. Within this structure, small functions as the central, basic prototype, while minor, tiny, and petite form peripheral, more specific layers of the category.

Semantically, small is broad in meaning, stylistically neutral, and highly frequent in everyday usage, which enables it to represent the concept "small" at a general, basic level.

By contrast, minor, tiny, and petite express the concept "small" from more specific perspectives: minor denotes relative or degree-based smallness (low importance); tiny conveys extreme smallness; and petite carries connotations of delicacy, compactness, and aesthetic nuance. This semantic narrowing explains their distance from the prototypical core. Although these words denote "smallness", they do so within restricted interpretative frames rather than as general category labels.

The initial hypothesis suggested that high (close) front vowels (/i/, /ɪ/) might strengthen the perception of smallness. However, the results indicate that this influence is limited. Although tiny and petite contain prominent front vowels, they were not rated higher than small. This suggests that the prototypicality of the concept "small" is not determined solely by phonetic factors but is more closely linked to semantic generality and usage frequency.

Thus, the symbolic influence of vowels appears to function as a secondary rather than a decisive factor for this concept.

The statistical analysis of the concept "small" leads to the following conclusions:

1. Small is the main prototype of the concept "small".
2. Minor, tiny, and petite are semantically specified, peripheral synonyms.
3. The symbolic influence of vowels is not clearly manifested for this concept.
4. Semantic generality and cognitive neutrality play a central role in determining prototypicality.

Overall, the concept "small" exhibits a well-defined prototypical structure within its synonym system: small forms the core of the category, while minor, tiny, and petite are perceived as peripheral units expressing additional semantic nuances.

C. Statistical and Semantic Analysis of the Concept "Sharp" (Kazakh "Otkir")

The concept "sharp" was examined through four English synonyms: sharp, acute, keen, and intense. Participants rated the degree to which each word corresponded to the concept "sharp" on a 1–5 Likert scale. The study employed a repeated-measures design, in which each respondent comparatively evaluated all synonyms. Accordingly, non-parametric statistical methods were applied.

Overall differences were tested using the Friedman test, and specific differences between pairs of synonyms were examined using the Wilcoxon signed-rank test with Bonferroni correction.

TABLE 3
WILCOXON PAIRWISE COMPARISON RESULTS FOR THE CONCEPT "SHARP"

Comparison	W	p_adj
Acute – Intense	930	0.025
Acute – Keen	526	1.000
Acute – Sharp	795	1.000
Intense – Keen	375	0.098
Intense – Sharp	400	0.477
Keen – Sharp	722	1.000

The pairwise comparisons reveal very limited differences for the concept "sharp." Specifically, a statistically significant difference was found only for the acute – intense pair (p_adj = 0.025). No significant differences were observed for the remaining pairs:

Acute – Keen (p_adj = 1.000)
Acute – Sharp (p_adj = 1.000)
Intense – Keen (p_adj = 0.098)
Intense – Sharp (p_adj = 0.477)
Keen – Sharp (p_adj = 1.000)

These results indicate that sharp, keen, and acute are perceived as very close to one another and are evaluated at an equivalent level in respondents' cognition.

sharp: M = 3.37, SD = 1.29, Med = 3
keen: M = 3.25, SD = 1.23, Med = 3
acute: M = 3.19, SD = 1.27, Med = 3
intense: M = 2.97, SD = 1.25, Med = 3

Descriptive statistics indicated closely clustered mean values for sharp (M = 3.37, SD = 1.29), keen (M = 3.25, SD = 1.23), acute (M = 3.19, SD = 1.27), and intense (M = 2.97, SD = 1.25). The median ratings (all Med = 3) suggest a flat or weak prototypical structure for this concept.

The findings suggest that the concept "sharp" does not exhibit a clear, single prototypical center. Unlike the concepts "big" or "small," no single word emerges as a dominant central prototype. Instead, a flat prototypical structure is formed, in which several synonyms occupy comparable positions. This pattern indicates that the cognitive representation of "sharp" is multidimensional rather than unidimensional.

Semantically, the concept "sharp" is used across several domains:

sharp – physical (e.g., knife, tool) as well as metaphorical (e.g., mind, speech);
keen – perception, sensitivity, attentiveness;
acute – technical, scientific, and medical contexts;
intense – strength, degree, emotional intensity.

Although all these words are related to the notion of sharpness, each is oriented toward a different semantic domain. As a result, respondents evaluated them not according to a single central criterion, but through multiple associative pathways.

According to the initial hypothesis, vowel quality was expected to influence the perception of the concept "sharp." However, the results indicate that this influence is weak. Despite phonological differences among sharp (/ɑː/), keen (/iː/), acute (/juː/), and intense (/ɛ/), no significant differences were found among most pairs. This suggests that for the concept "sharp," semantic and pragmatic factors outweigh phonological symbolism. In other words, vowel symbolism plays a secondary, non-decisive role.

The statistical analysis of the concept "sharp" leads to the following conclusions:

1. The concept "sharp" lacks a single, clearly defined prototypical center.
2. Sharp, keen, and acute are perceived at an equivalent level in respondents' cognition.
3. Intense shows a certain degree of semantic divergence from the core meaning of "sharp."
4. The primary factor shaping prototypicality for this concept is semantic multidimensionality.
5. The symbolic influence of vowels is weak and limited for the concept "sharp."

Overall, the synonym system of the concept "sharp" does not display a clear prototypical core: several synonyms are perceived at the same level, reflecting the concept's multidimensional and semantically differentiated nature. In this case, differences between semantic domains play a more decisive role than phonological factors.

D. Statistical and Semantic Analysis of the Concept "Round" (Kazakh "Dongelek")

The concept "round" was examined through four English synonyms: round, circle, circular, and spherical. Participants rated the degree to which each word corresponded to the concept "round" on a 1–5 Likert scale. As the study followed a repeated-measures design, the Friedman test and the Wilcoxon signed-rank test with Bonferroni correction were applied (Table 4).

TABLE 4
WILCOXON PAIRWISE COMPARISON RESULTS FOR THE CONCEPT "ROUND"

Comparison	W	p_adj
Circle – Circular	788	0.455
Circle – Round	490	1.000
Circle – Spherical	912	0.016
Circular – Round	419	0.126
Circular – Spherical	610	0.091
Round – Spherical	963	0.003

The pairwise comparisons show significant differences for the following pairs: circle – spherical (p_adj = 0.016) and round – spherical (p_adj = 0.003). These results indicate that spherical differs significantly from round and circle. No significant differences were found for the remaining pairs:

Circle – Circular (p_adj = 0.455)
Circle – Round (p_adj = 1.000)
Circular – Round (p_adj = 0.126)
Circular – Spherical (p_adj = 0.091)

Thus, round, circle, and circular are perceived as closely related, whereas spherical is perceived as relatively distinct.

round: M = 3.64, SD = 1.27, Med = 4
circle: M = 3.49, SD = 1.25, Med = 4
circular: M = 3.22, SD = 1.24, Med = 3
spherical: M = 2.67, SD = 1.32, Med = 2

Descriptive statistics showed that round (M = 3.64, SD = 1.27) and circle (M = 3.49, SD = 1.25) obtained the highest mean ratings, followed by circular (M = 3.22, SD = 1.24), whereas spherical (M = 2.67, SD = 1.32) showed the lowest mean. The median values (Med_round = 4; Med_circle = 4; Med_circular = 3; Med_spherical = 2) reflect the same pattern.

The results suggest that the prototypical center of the concept "round" is grounded in everyday, experiential cognition. Round and circle occupy this center, as they represent the simplest, most visually accessible, two-dimensional representations of roundness. Circular, by contrast, has a more descriptive and abstract character and is typically used in attributive contexts. Spherical shifts the concept into a three-dimensional, geometric–scientific domain, which explains its distance from the prototypical core.

For the concept "round," semantic differences emerge along dimensional (2D vs. 3D) and register-based (everyday vs. scientific) lines:

round / circle – everyday, cognitively accessible;
circular – descriptive, abstract;
spherical – technical, scientific, terminological.

These distinctions directly influence participants' ratings and push spherical toward the periphery of the category.

Although vowel symbolism was initially hypothesized to influence perception, no clear effect was observed for the concept "round." Despite phonological differences among round (/aʊ/), circle (/ɜː/), circular (/ɜː/), and spherical (/ɪə/), prototypicality was determined by semantic level rather than phonological composition. This finding indicates that conceptual geometry and experiential knowledge outweigh phonological symbolism for this concept.

The statistical analysis of the concept "round" leads to the following conclusions:

1. Round and circle are the primary prototypical representatives of the concept "round."
2. Circular is close to the core but is perceived at a more abstract level.
3. Spherical is distant from the prototypical center due to its three-dimensional, scientific character.
4. The main factor determining prototypicality for this concept is semantic level and experiential familiarity.
5. The symbolic influence of vowels does not play a decisive role for the concept "round".

In sum, the concept "round" exhibits a prototype structure grounded in everyday experience: round and circle form the core of the category, while spherical occupies a peripheral position due to its shift toward a scientific–geometric domain. In this case, prototypicality is shaped by conceptual and semantic factors rather than phonological ones.

E. Statistical and Semantic Analysis of the Concept "Dark" (Kazakh "Qarangy")

The concept "dark" was examined through four English synonyms: dark, dusky, murky, and obscure. Participants rated the degree to which each word corresponded to the concept "dark" on a 1–5 Likert scale. Since each respondent evaluated all synonyms comparatively, the data were treated as repeated measures. Accordingly, the Friedman test was applied, followed by the Wilcoxon signed-rank test with Bonferroni correction to identify specific differences (Table 5).

TABLE 5
WILCOXON PAIRWISE COMPARISON RESULTS FOR THE CONCEPT "DARK"

Comparison	W	p_adj
Dark – Dusky	1307	< .001
Dark – Murky	1370	< .001
Dark – Obscure	1426	< .001
Dusky – Murky	582	0.232
Dusky – Obscure	664	0.013
Murky – Obscure	508	0.538

The pairwise comparisons clearly demonstrate the presence of a strong prototypical center for the concept "dark." In particular, dark differs significantly from all other synonyms:

Dark – Dusky: p_adj = 0.00000066
Dark – Murky: p_adj = 0.000000323
Dark – Obscure: p_adj = 0.000000179

These results indicate that dark is rated significantly higher than the remaining synonyms in representing the concept "dark."

At the same time, no significant differences were observed between the following pairs:

Dusky – Murky (p_adj = 0.232)
Murky – Obscure (p_adj = 0.538)

Only one pair showed a limited difference:

Dusky – Obscure (p_adj = 0.013)

Overall, the results indicate that the concept "dark" exhibits a highly salient prototypical structure. Within this structure, dark functions as the central and dominant prototype, while dusky, murky, and obscure occupy peripheral positions.

dark: M = 4.09, SD = 1.22, Med = 5
dusky: M = 2.61, SD = 1.28, Med = 2
murky: M = 2.49, SD = 1.24, Med = 2
obscure: M = 2.33, SD = 1.21, Med = 2

Descriptive statistics revealed that dark received the highest mean rating (M = 4.09, SD = 1.22), whereas dusky (M = 2.61, SD = 1.28), murky (M = 2.49, SD = 1.24), and obscure (M = 2.33, SD = 1.21) were rated lower. The median values (Med_dark = 5; Med_dusky = 2; Med_murky = 2; Med_obscure = 2) confirm the strong prototypical status of dark.

Semantically, dark is a general, neutral, and highly frequent lexical item in everyday usage. It therefore conveys the meaning of darkness directly, without additional semantic specification.

The remaining synonyms represent the concept of darkness from more restricted semantic perspectives:

dusky – a transitional state between light and darkness (twilight, dimness);
murky – cloudy, gloomy, often associated with an unpleasant or opaque atmosphere;
obscure – abstract, vague, or unclear, frequently used metaphorically.

Because these words narrow and specify the notion of darkness, they are displaced from the prototypical center.

According to the initial hypothesis, back and low vowels were expected to evoke associations of darkness, depth, and heaviness. From this perspective, the results partially support the sound-symbolism hypothesis. The vowel /ɑː/ in dark is acoustically open, low-frequency, and articulatorily broad, which aligns with associations of depth and heaviness. By contrast, dusky, murky, and obscure exhibit greater phonological complexity and tend to describe darkness indirectly rather than directly. Nevertheless, phonological factors alone do not determine prototypicality; rather, they interact with semantic generality.

The statistical analysis of the concept "dark" leads to the following conclusions:

1. Dark is the clear and stable prototype of the concept "dark."
2. Dusky, murky, and obscure are semantically peripheral synonyms.
3. Semantic generality and usage frequency play a primary role in determining prototypicality.
4. The symbolic influence of vowels is noticeable for this concept, but it operates in conjunction with semantic factors.

In sum, the concept "dark" displays a clearly defined prototypical structure within its synonym system: dark occupies the central position as the most direct and neutral expression of darkness, while dusky, murky, and obscure are perceived as peripheral due to their semantic specification.

F. Statistical and Semantic Analysis of the Concept "Light" (Kazakh "Zharyq")

The concept "light" was examined through four English synonyms: bright, light, vivid, and illuminated. Participants rated the degree to which each word corresponded to the concept "light" on a 1–5 Likert scale. Since each respondent evaluated all synonyms, the data were treated as repeated measures. Accordingly, the Friedman test was applied, followed by the Wilcoxon signed-rank test with Bonferroni correction to identify specific differences (Table 6).

TABLE 6
WILCOXON PAIRWISE COMPARISON RESULTS FOR THE CONCEPT "LIGHT"

Comparison	W	p_adj
Bright – Illuminated	710	0.006
Bright – Light	148	0.001
Bright – Vivid	960	< .001
Illuminated – Light	146	< .001
Illuminated – Vivid	336	0.044
Light – Vivid	1268	< .001

The pairwise comparisons reveal a clear internal hierarchy among the synonyms of the concept "light." Statistically significant differences were observed for nearly all pairs:

Bright – Illuminated: p_adj = 0.006
Bright – Light: p_adj = 0.001
Bright – Vivid: p_adj = 0.0000207
Illuminated – Light: p_adj = 0.00000325
Illuminated – Vivid: p_adj = 0.044
Light – Vivid: p_adj = 0.0000000666

These results indicate that the synonyms of "light" are not perceived at an equal level but rather form a well-defined hierarchical structure.

bright: M = 3.94, SD = 1.21, Med = 4
light: M = 3.10, SD = 1.29, Med = 3
illuminated: M = 2.75, SD = 1.32, Med = 3
vivid: M = 2.21, SD = 1.19, Med = 2

Descriptive statistics showed a clear hierarchy: bright (M = 3.94, SD = 1.21) obtained the highest mean rating, followed by light (M = 3.10, SD = 1.29), illuminated (M = 2.75, SD = 1.32), and vivid (M = 2.21, SD = 1.19). The median values (Med_bright = 4; Med_light = 3; Med_illuminated = 3; Med_vivid = 2) support this ordering.

The findings demonstrate the presence of a clear prototypical center for the concept "light," occupied by bright. This word conveys brightness directly and vividly and is frequently used in everyday language, often with a positive and emotionally salient connotation.

Although light denotes basic physical illumination, its polysemy (e.g., "not heavy," "easy") weakens its prototypical clarity. Illuminated refers to the resultant or processual state of being lit, which distances it from the prototypical core. Vivid, in turn, is oriented more toward intensity of perception, color saturation, or impression rather than light itself.

Thus, the synonyms reflect different semantic layers of the concept "light":

bright – direct, salient brightness;
light – basic, physical illumination;
illuminated – a resultant or processual state;
vivid – intensity of perception or color rather than light per se.

This semantic stratification is clearly reflected in participants' ratings and accounts for the observed hierarchy.

The results for the concept "light" partially support the sound-symbolism hypothesis. The diphthong /aɪ/ in bright produces a dynamic, energetic acoustic effect that enhances the perception of brightness and brilliance. Although light also contains the diphthong /aɪ/, its semantic polysemy reduces its prototypical status. The short vowel /ɪ/ in vivid is more closely associated with clarity or intensity than with light itself. Thus, phonological factors interact with semantic content but do not independently determine prototypicality.

The statistical analysis of the concept "light" leads to the following conclusions:

1. Bright is the primary prototype of the concept "light."
2. Light is a basic synonym but is slightly displaced from the center due to its polysemy.
3. Illuminated is a processual, peripheral unit.
4. Vivid is semantically peripheral, oriented toward perceptual intensity rather than light itself.
5. The symbolic influence of vowels is observable but operates together with semantic factors.

Overall, the concept "light" exhibits a complex hierarchical structure within its synonym system: bright functions as the central prototype, while light, illuminated, and vivid occupy different peripheral levels depending on their semantic specification. These findings highlight the interaction of phonological and semantic factors in the cognitive perception of light.

G. Statistical and Semantic Analysis of the Concept "Easy" (Kazakh "Zhengil")

The Kazakh concept «Easy» was examined through four English synonyms: easy, gentle, mild, and soft. Participants rated the degree to which each word corresponded to the concept «Easy» on a 1–5 Likert scale. Because each respondent evaluated all four synonyms, the data were treated as repeated measures. Accordingly, the Friedman test was used, followed by the Wilcoxon signed-rank test with Bonferroni correction to identify specific differences (Table 7).

TABLE 7
WILCOXON PAIRWISE COMPARISON RESULTS FOR THE CONCEPT "EASY"

Comparison	W	p_adj
Easy – Gentle	1056	< .001
Easy – Mild	1196	< .001
Easy – Soft	838	< .001
Gentle – Mild	329	1.000
Gentle – Soft	363	1.000
Mild – Soft	440	1.000

The pairwise comparisons indicate a clear central prototype for this concept. Easy differs significantly from all other synonyms:

Easy – Gentle: p_adj < 0.001
Easy – Mild: p_adj < 0.001
Easy – Soft: p_adj < 0.001

No statistically significant differences were found among the remaining pairs:

Gentle – Mild (p_adj = 1.000)
Gentle – Soft (p_adj = 1.000)
Mild – Soft (p_adj = 1.000)

These results show that easy is evaluated significantly differently from the other three words, whereas gentle, mild, and soft are perceived at a comparable level.

easy: M = 4.18, SD = 1.11, Med = 5
gentle: M = 2.66, SD = 1.30, Med = 2
mild: M = 2.57, SD = 1.27, Med = 2
soft: M = 2.42, SD = 1.22, Med = 2

Descriptive statistics indicated that easy received the highest mean rating (M = 4.18, SD = 1.11), while gentle (M = 2.66, SD = 1.30), mild (M = 2.57, SD = 1.27), and soft (M = 2.42, SD = 1.22) clustered at a lower level. The medians (Med_easy = 5; Med_gentle = 2; Med_mild = 2; Med_soft = 2) reflect the same distribution.

Overall, the findings confirm that the concept «Easy» has a well-defined prototypical structure. Within this structure, easy functions as the central, dominant prototype. It conveys the meaning of "easy/light" directly and neutrally and is highly frequent in everyday usage. By contrast, gentle, mild, and soft express the concept more indirectly and tend to capture qualitative or affective aspects, which shifts them away from the prototypical core.

Semantically, the four synonyms map onto different domains:

easy – absence of difficulty; ease of performance;
gentle – softness, delicacy, low impact;
mild – low intensity; moderate/soft character;
soft – tactile or physical softness.

Although all of these words can be associated with «Easy», each belongs to a different semantic domain. Consequently, only easy represents the concept at the general, basic level.

According to the initial hypothesis, front/high vowels were expected to strengthen associations of lightness and softness. In this case, easy shows clear dominance, which may be interpreted as partially consistent with the hypothesized sound–meaning link. However, gentle does not display the same phonological profile, and the overall pattern indicates that phonological factors are not decisive for this concept. Instead, semantic generality and cognitive neutrality play the primary role, while vowel symbolism remains secondary.

The statistical analysis of the concept «Easy» leads to the following conclusions:

1. Easy is the clear and stable prototype of the concept «Easy».
2. Gentle, mild, and soft are semantically peripheral synonyms.
3. Semantic generality and usage frequency are the main determinants of prototypicality.
4. The symbolic influence of vowels is limited for this concept.

In sum, the synonym system of «Easy» exhibits a clear prototype structure: easy occupies the central position as the most direct and neutral expression, whereas gentle, mild, and soft are perceived as peripheral due to their semantic specification.

H. Statistical and Semantic Analysis of the Concept "Heavy" (Kazakh "Awyr")

The Kazakh concept «Awyr» was examined through four English synonyms: heavy, hard, tough, and burdensome. Participants rated the degree to which each word corresponded to the concept «Awyr» on a 1–5 Likert scale. Since each respondent evaluated all synonyms, the data were treated as repeated measures. Accordingly, the Friedman test was applied, followed by the Wilcoxon signed-rank test with Bonferroni correction to identify specific differences (Table 8).

TABLE 8
WILCOXON PAIRWISE COMPARISON RESULTS FOR THE CONCEPT "HEAVY"

Comparison	W	p_adj
Burdensome – Hard	131	< .001
Burdensome – Heavy	176	0.037
Burdensome – Tough	114	< .001
Hard – Heavy	1036	0.008
Hard – Tough	625	0.714
Heavy – Tough	402	0.207

The pairwise comparisons indicate that the concept «Awyr» has a clear prototypical center, with heavy emerging as the key prototype. In general, hard, tough, and burdensome do not consistently differ from one another, suggesting that these three items are perceived at a relatively similar level, while the category is structured around a central core (heavy) with peripheral layers.

heavy: M = 3.91, SD = 1.19, Med = 4
hard: M = 2.82, SD = 1.31, Med = 3
tough: M = 2.75, SD = 1.28, Med = 3
burdensome: M = 2.11, SD = 1.18, Med = 2

Descriptive statistics showed that heavy obtained the highest mean rating (M = 3.91, SD = 1.19), whereas hard (M = 2.82, SD = 1.31), tough (M = 2.75, SD = 1.28), and burdensome (M = 2.11, SD = 1.18) were rated lower. The median values (Med_heavy = 4; Med_hard = 3; Med_tough = 3; Med_burdensome = 2) confirmed this pattern.

The results confirm a clear prototypical structure for the concept «Awyr». Within this structure, heavy functions as the central, dominant prototype. It conveys the meaning of heaviness directly, primarily in relation to physical weight, and is relatively neutral semantically. By contrast, hard, tough, and burdensome represent the concept more indirectly and often through metaphorical or evaluative extensions, which distances them from the prototypical core.

The semantic distinctions among the synonyms are clear:

heavy – direct physical weight;
hard – difficulty, hardness, durability/rigidity;
tough – demanding, requiring endurance;
burdensome – evaluative/emotional sense of "a burden" or "a load."

These words distribute the meaning of «Awyr» across different semantic domains (physical, psychological, evaluative). As a result, heavy emerges as the most prototypical representative.

According to the initial hypothesis, back/low vowels were expected to evoke associations of heaviness, weight, and stability. In this case, although heavy does not contain a straightforward "heavy" vowel profile, its relative phonological simplicity may contribute to its cognitive centrality. By contrast, the polysyllabic and phonologically complex burdensome tends to express heaviness indirectly and in a strongly evaluative manner. Thus, vowel symbolism is not a direct determinant; rather, it interacts with semantic generality and usage frequency.

The statistical analysis of the concept «Awyr» supports the following conclusions:

1. Heavy is the main prototype of the concept «Awyr».
2. Hard, tough, and burdensome are semantically specified, peripheral synonyms.
3. Physical concreteness and semantic neutrality play a decisive role in prototypicality.
4. The symbolic influence of vowels is limited and secondary for this concept.

Overall, the synonym system of «Awyr» exhibits a clear prototype structure: heavy is perceived as the central prototype directly denoting physical weight, while hard, tough, and burdensome occupy peripheral positions due to semantic narrowing and evaluative or metaphorical extensions.

I. Statistical and Semantic Analysis of the Concept "Fast" (Kazakh "Zhyldam")

The concept "fast" was examined through four English synonyms: fast, quick, prompt, and brisk. Participants rated the degree to which each word corresponded to the concept "fast" on a 1–5 Likert scale. Since each respondent evaluated all synonyms, the data were treated as repeated measures. Accordingly, the Friedman test was applied, followed by the Wilcoxon signed-rank test with Bonferroni correction to identify specific differences (Table 9).

TABLE 9
WILCOXON PAIRWISE COMPARISON RESULTS FOR THE CONCEPT "FAST"

Comparison	W	p_adj
Brisk – Fast	81	< .001
Brisk – Prompt	458	1.000
Brisk – Quick	310	0.443
Fast – Prompt	1428	< .001
Fast – Quick	952	< .001
Prompt – Quick	258	0.025

The pairwise comparisons demonstrate a clear prototypical center for the concept "fast." In particular, fast differs significantly from all other synonyms:

Fast – Brisk: p_adj = 0.000011
Fast – Quick: p_adj = 0.000198
Fast – Prompt: p_adj = 0.0000000145

These results indicate that fast is rated significantly higher than the remaining synonyms.

At the same time, differences among the other pairs are limited or absent:

Brisk – Prompt (p_adj = 1.000)
Brisk – Quick (p_adj = 0.443)
Prompt – Quick (p_adj = 0.025)

Although the last pair shows a modest difference, it does not undermine the central prototypical status of fast.

fast: M = 4.03, SD = 1.17, Med = 5
quick: M = 3.18, SD = 1.25, Med = 3
prompt: M = 2.74, SD = 1.27, Med = 3
brisk: M = 2.81, SD = 1.23, Med = 3

Descriptive statistics revealed that fast received the highest mean rating (M = 4.03, SD = 1.17), followed by quick (M = 3.18, SD = 1.25), brisk (M = 2.81, SD = 1.23), and prompt (M = 2.74, SD = 1.27). The medians (Med_fast = 5; Med_quick = 3; Med_brisk = 3; Med_prompt = 3) support the central role of fast.

Overall, the findings confirm that the concept "fast" has a well-defined prototypical structure. Within this structure, fast is perceived as the central and dominant prototype. It expresses speed in its most direct and general sense. By contrast, quick, prompt, and brisk specify speed from particular perspectives:

quick – rapid completion within a short time span;
prompt – immediacy of response, emphasis on timing;
brisk – energetic, lively movement.

This semantic specification shifts these synonyms away from the prototypical core.

The synonyms of "fast" are thus distributed across different semantic domains:

fast – universal, broad meaning;
quick – short temporal duration;
prompt – timely reaction;
brisk – energetic, vigorous movement.

Participants appear to have intuitively recognized these distinctions and selected fast as the primary reference point in their evaluations.

According to the initial hypothesis, front vowels were expected to evoke associations of movement, energy, and dynamism. From this perspective, the vowel /æ/ in fast may produce a dynamic acoustic impression that reinforces the perception of speed. Although the vowels in quick (/ɪ/) and prompt (/ɒ/) contribute to more specific interpretations of speed, they do not establish prototypical centrality. Thus, phonological factors play a supportive rather than decisive role for this concept.

The statistical analysis of the concept "fast" leads to the following conclusions:

1. Fast is the clear and stable prototype of the concept "fast."
2. Quick, prompt, and brisk are semantically specified, peripheral synonyms.
3. Semantic generality and usage frequency are the primary determinants of prototypicality.
4. The symbolic influence of vowels is partial and secondary for this concept.

In sum, the synonym system of "fast" exhibits a clear prototypical structure: fast functions as the central prototype expressing speed in the most direct and neutral way, while quick, prompt, and brisk occupy peripheral positions due to their semantic specification.

J. Statistical and Semantic Analysis of the Concept "Slow" (Kazakh "Bajaw")

The concept "slow" was examined through four English synonyms: slow, sluggish, lagging, and lethargic. Participants rated the degree to which each word corresponded to the concept "slow" on a 1–5 Likert scale. Since each respondent evaluated all synonyms, the data were treated as repeated measures. Accordingly, the Friedman test was applied, followed by the Wilcoxon signed-rank test with Bonferroni correction to identify specific differences (Table 10).

TABLE 10
WILCOXON PAIRWISE COMPARISON RESULTS FOR THE CONCEPT "SLOW"

Comparison	W	p_adj
Lagging – Lethargic	612	0.002
Lagging – Slow	195	< .001
Lagging – Sluggish	524	1.000
Lethargic – Slow	72.5	< .001
Lethargic – Sluggish	108	0.003
Slow – Sluggish	1129	< .001

The pairwise comparisons reveal a very clear prototypical center for the concept "slow." Specifically, slow differs significantly from all other synonyms:

Slow – Lagging: p_adj = 0.000166
Slow – Lethargic: p_adj = 0.000000374
Slow – Sluggish: p_adj = 0.00000756

In addition, significant differences were found for lethargic – lagging (p_adj = 0.002) and lethargic – sluggish (p_adj = 0.003), whereas no significant difference was observed for lagging – sluggish (p_adj = 1.000).

slow: M = 4.06, SD = 1.16, Med = 5
sluggish: M = 2.73, SD = 1.29, Med = 3
lagging: M = 2.61, SD = 1.24, Med = 2
lethargic: M = 2.33, SD = 1.21, Med = 2

Descriptive statistics showed that slow obtained the highest mean rating (M = 4.06, SD = 1.16), whereas sluggish (M = 2.73, SD = 1.29), lagging (M = 2.61, SD = 1.24), and lethargic (M = 2.33, SD = 1.21) received lower scores. The median values (Med_slow = 5; Med_sluggish = 3; Med_lagging = 2; Med_lethargic = 2) confirm the strong prototypical status of slow.

These results demonstrate that the concept "slow" has a highly salient prototypical structure. Within this structure, slow clearly emerges as the central, dominant prototype. It expresses slowness directly, neutrally, and without evaluative connotations. By contrast, sluggish, lagging, and lethargic encode additional semantic nuances, which distances them from the prototypical core.

Semantically, the synonyms of "slow" are clearly differentiated:

slow – low speed of movement or process (neutral);
sluggish – slowness combined with inertia or negative evaluation;
lagging – relative slowness, falling behind;
lethargic – physiological or psychological weakness, fatigue.

These semantic specifications are reflected in participants' ratings and indicate that only slow represents the pure, basic notion of slowness.

According to the initial hypothesis, long vowels or diphthongs were expected to evoke associations of slowness and temporal extension. In this respect, the diphthong /əʊ/ in slow is articulated in a prolonged manner and produces an acoustic impression of duration, which is congruent with the meaning of slowness. This phonological property may thus reinforce the prototypical status of slow. By contrast, the shorter vowels and more complex syllabic structures of sluggish and lethargic tend to convey slowness indirectly and evaluatively. Consequently, for this concept, phonological factors interact with semantic content to strengthen prototypicality.

The statistical analysis of the concept "slow" leads to the following conclusions:

1. Slow is the clear, stable, and most central prototype of the concept "slow."
2. Sluggish, lagging, and lethargic are semantically specified, evaluative, or relative peripheral synonyms.
3. Semantic neutrality and generality play a decisive role in determining prototypicality.
4. The symbolic influence of vowels is clearly observable for this concept, particularly through the effect of a long diphthong.

Overall, the concept "slow" exhibits a highly transparent prototypical structure within its synonym system: slow functions as the primary prototype expressing slowness in the most direct, neutral, and non-evaluative way, while sluggish, lagging, and lethargic occupy peripheral positions due to their additional semantic nuances.

IV. Discussion

This study examined English synonym sets corresponding to basic semantic concepts in Kazakh (big, small, sharp, round, dark, light, heavy, easy/light, fast, and slow) on the basis of empirical data, with the aim of identifying their prototypical structure and its relationship to sound-symbolic factors. Participants' ratings were analyzed using non-parametric statistical procedures appropriate for a repeated-measures design, enabling a comparative view of the internal semantic organization of the target concepts.

The findings show that a single prototypical pattern does not apply uniformly across all concepts. Nevertheless, for the majority of concepts, a clear prototypical center was identified. Specifically, for big, small, dark, easy/light, fast, and slow, one synonym was consistently rated higher than the alternatives and differed significantly from them in statistical terms. These central items are semantically the most neutral, the broadest in meaning, and the most frequent in everyday usage. Together, these characteristics appear to facilitate their prototypical status at the cognitive level.

For example, big emerged as the core representative for the concept "big", small for "small", easy for «Easy», fast for "fast", and slow for "slow." These outcomes align closely with the central claims of prototype theory: prototypes are typically semantically general, stylistically unmarked, and cognitively accessible units within a category.

At the same time, several concepts displayed more complex prototypical configurations. For "sharp", the absence of a single dominant prototype can be attributed to semantic multidimensionality. Synonyms such as sharp, keen, acute, and intense are distributed across physical, cognitive, and evaluative domains, and were therefore perceived at comparable

levels by respondents. This distribution weakens the emergence of a single center and promotes a flat or potentially multicentric prototype structure.

A partially similar pattern was observed for "round." While round and circle were closely aligned with everyday experience, spherical was positioned farther from the prototypical center due to its association with scientific and geometric abstraction. This result indicates that prototypicality is shaped not only by linguistic form but also by experiential knowledge and conceptual accessibility.

The concept "heavy" revealed yet another configuration. Here, heavy, hard, and tough clustered relatively closely, while burdensome shifted toward the periphery due to its abstract and evaluative meaning. This pattern reflects a clear distinction between physical and metaphorical dimensions of heaviness and provides direct evidence for the impact of semantic domain structure on prototypicality.

Regarding vowel-based sound symbolism, the findings only partially support the initial hypothesis. Although certain concepts (e.g., slow, dark, and fast) showed some correspondence between phonological structure and semantic perception, this factor did not function as a universal or decisive mechanism for prototypicality across all concepts. The presence of front/high vowels did not automatically intensify associations of lightness or smallness, just as back/low vowels did not consistently evoke heaviness or slowness in every case.

In the context of synonym sets, these results suggest that sound symbolism should not be treated as an absolute or universal law. Rather, it functions as a secondary factor that interacts with semantic content, usage frequency, and cognitive neutrality. In other words, phonological effects do not independently establish prototypicality, but they may reinforce it when they align with meaning and conceptual expectations.

Overall, the empirical findings support the key tenets of prototype theory. Conceptual categories appear to constitute multi-level systems in which semantic generality, pragmatic neutrality, usage frequency, and experiential cognition play central roles. Vowel symbolism emerges as a context-dependent, second-order factor within this system.

From this perspective, the study contributes to a more precise account of the relationship between sound symbolism and prototypicality by demonstrating that their interaction is not one-directional. The results are relevant for research in cognitive linguistics, psycholinguistics, and semantics, and they provide a foundation for future experimental investigations of conceptual representations in language.

V. Conclusion

This study analyzed English synonym sets corresponding to basic semantic concepts in Kazakh (big, small, sharp, round, dark, light, heavy, easy/light, fast, and slow) on the basis of empirical data, with the aim of identifying prototypical structures and their relationship to sound-symbolic factors. Participants' ratings were analyzed using non-parametric statistical procedures suitable for a repeated-measures design, increasing the robustness of the reported findings.

The results revealed a clear prototypical center for many concepts. In particular, big, small, dark, heavy, easy, fast, and slow were perceived as the core, neutral representatives of their respective conceptual categories. Their prototypical status is best explained by semantic generality, stylistic neutrality, and high frequency in everyday language use. By contrast, the remaining synonyms tended to occupy peripheral positions due to semantic specification, evaluative meaning, or expressive nuance.

At the same time, prototypical structures were not uniform across all concepts. For "sharp" and, to some extent, "round", the prototypical center was weak or multicentric, reflecting semantic multidimensionality and coverage of distinct conceptual domains. This finding indicates that prototypicality is context-sensitive and depends on semantic structure rather than following a single universal template.

With regard to vowel symbolism, the empirical evidence only partially supports the initial hypothesis. While some concepts (dark, slow, and fast) showed certain correspondences between phonological profile and semantic perception, the effect was weak or absent for other concepts. Thus, within synonym systems, sound symbolism does not operate as the primary determinant of prototypicality; instead, it functions as a secondary mechanism interacting with semantic content, cognitive accessibility, and usage frequency.

Overall, the findings empirically support the basic principles of prototype theory and suggest that sound symbolism should be treated as a contextual and multifactorial phenomenon. The linguistic representation of conceptual categories is shaped not only by phonological form, but also by cognitive experience, semantic structuring, and habitual language use.

Limitations and future research

Despite the promising results, the present study has several limitations. First, the sample consisted only of Kazakh-speaking respondents, which restricts the generalizability of the findings across other linguistic and cultural groups. Future studies should include native English speakers and bilingual participants to allow cross-linguistic comparisons.

Second, the data were collected online via Google Forms, which limits experimental control over participants' environment and response conditions. Laboratory-based studies may provide more controlled and reliable measurements.

Third, the analysis relied on perceptual ratings only and did not include acoustic measurements of phonological properties (e.g., vowel formants, duration, intensity). Future research could integrate phonetic and acoustic analyses to better examine the interaction between sound symbolism and conceptual perception.

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