

## Research Article

# Template Formulation and Specificity in Informed Consent Forms: Textual Similarity and Turkish Readability Analysis in Orthopedic Surgery

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### Abstract

**Objectives:** This study evaluated textual similarity and Turkish readability levels of informed consent forms used in orthopedic and traumatology surgery and investigated the relationship between template-based text formulation and readability parameters.

**Methods:** This cross-sectional descriptive text analysis included 13 informed consent forms covering arthroplasty, trauma, tumor, amputation, hand, peripheral nerve, pediatric, and general orthopedic procedures. Documents were digitized and standardized by removing administrative and non-informative content. Textual similarity was assessed using TF-IDF vectorization with cosine similarity and three-word n-gram Jaccard analysis. Turkish readability was evaluated using Ateşman and Bezirci-Yılmaz formulas. Associations between similarity and readability were analyzed using Pearson and Spearman correlation tests.

**Results:** The mean consent form length was 1,720 words (range: 1,050–2,380). Ateşman scores ranged from 4.8 to 46.1, indicating moderate-to-difficult readability, while Bezirci-Yılmaz scores (16.5–46.7) suggested postgraduate-level comprehension requirements. Mean textual similarity was 53.8%. A strong positive correlation was observed between textual similarity and Ateşman readability ( $r=0.85$ ,  $p<0.001$ ), whereas no significant association was found with Bezirci-Yılmaz scores.

**Conclusion:** Orthopedic consent forms are largely template-based and exceed patient-level readability. Simplified, procedure-specific, and visually supported materials may improve patient understanding.

**Keywords:** Informed consent, Readability, Textual similarity

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Informed consent is one of the most fundamental ethical and legal components of medical practice and law, safeguarding patient autonomy.<sup>[1]</sup> Patients must be adequately and clearly informed about the risks, treatment options, and consequences of inaction.<sup>[2]</sup> This practice is not only a legal requirement, but is also considered essential for building trust and improving communication between pa-

tients and physicians, as well as for improving adherence to treatment.<sup>[3]</sup>

Orthopaedic and trauma surgeries cover a wide range of conditions and associated risks.<sup>[4]</sup> Consequently, informed consent forms should provide detailed information about each specific procedure and use language that patients can understand. However, many consent forms utilise stan-

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standardised templates, resulting in similar wording that fails to address the needs of individual patients.<sup>[5]</sup> This practice may hinder the delivery of information tailored to individual patients.

The effectiveness of patient information texts largely depends on their readability level. The Ateşman<sup>[5]</sup> and Bezirci–Yılmaz<sup>[6]</sup> formulas, which are used to evaluate the readability of Turkish texts, reveal a text's grammatical fluency and the level of training required to comprehend it.<sup>[7]</sup> There are few studies on the readability of orthopaedic information texts in the literature, and none that evaluate informed consent forms in terms of both textual similarity and readability.<sup>[8,9]</sup>

This study aims to evaluate the textual similarity of informed consent forms used in orthopaedic and traumatology surgery, examining the relationship between this similarity and Turkish readability parameters.

## Methods

This cross-sectional, descriptive text analysis study was designed to evaluate the textual similarity and readability characteristics of informed consent forms used in an orthopaedics and traumatology clinic. A total of 13 informed consent forms currently in use at the same healthcare facility and relating to various orthopaedic surgical procedures were included in the study. The examined documents encompassed consent texts prepared for arthroplasty, trauma, amputation, tumour, hand, peripheral nerve, paediatric orthopaedic, and general orthopaedic surgical procedures. Prior to analysis, all consent forms were digitised. To ensure textual comparability, the analysis excluded the patient name, file number, date, signature fields, and administrative headings. The texts were standardised and converted to lowercase, and punctuation marks and expressions lacking semantic value were removed. Analysis was performed only on the main informative texts relating to the patient.

The level of textual similarity between consent forms was evaluated using two complementary methods. First, each consent form was vectorised using the term frequency–inverse document frequency (TF–IDF) method, and the semantic similarity between the texts was calculated using the cosine similarity coefficient.<sup>[10]</sup> Secondly, three-word n-gram sequences were created to reveal recurring expressions and sentence structures, and the overlap between the texts was determined using the Jaccard similarity coefficient.<sup>[11]</sup> All analyses were conducted in the Python programming environment (Python Software Foundation, Wilmington, DE, USA) using commonly available libraries, including scikit-learn for TF–IDF vectorization and NLTK for n-gram generation and similarity calculations. The average

similarity ratio of each consent form to other documents was then calculated and visualised using a heat map.

A Turkish readability assessment was conducted using the Ateşman<sup>[5]</sup> and Bezirci–Yılmaz<sup>[6]</sup> formulas.<sup>[7]</sup> The Ateşman formula evaluates text fluency based on syllable and word count per sentence. The Bezirci–Yılmaz formula, on the other hand, determines the level of education required to understand the text by considering the distribution of words with different syllable lengths. To this end, the total number of words, sentences, and syllables was calculated for each consent form, and the average word and sentence lengths were determined.

As the study only involved analysing the content of institutional documents that did not contain patient information, ethical committee approval was not required.

## Statistical Analysis

Pearson and Spearman correlation analyses were used to evaluate the relationship between textual similarity and readability scores. Descriptive statistics were presented as mean, minimum, and maximum values. All statistical analyses were performed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY, USA).

## Results

The study included a total of 13 different informed consent forms used in orthopedic and traumatology practice. The documents examined covered arthroplasty surgeries, trauma surgery, tumor surgery, amputation surgery, hand surgery, peripheral nerve surgery, pediatric orthopedics, and general orthopedic surgery procedures (Table 1). When the informative main texts of the examined informed consent forms were evaluated, it was determined that the average word count was approximately 1,720, and the text lengths ranged from approximately 1,050 to 2,380 words.

## Readability Analysis

In the readability assessment of consent forms, it was determined that the scores ranged from 4.8 to 46.1 according to the Ateşman index. The highest Ateşman score was obtained in the amputation surgery consent form (46.1), while the lowest score was found in the general orthopedics consent form (4.8) (Fig. 1). Overall, it was observed that the majority of the texts examined were at a difficult or moderate-difficult readability level according to the Ateşman classification.

In the Bezirci–Yılmaz readability analysis, the scores were found to range between 16.5 and 46.7. The trigger finger surgery consent form had the lowest Bezirci–Yılmaz score (16.5), indicating a lower level of education compared to other documents. In contrast, the general orthopedics

**Table 1.** Readability indices and mean textual similarity of orthopedic informed consent forms

Code	Consent form	Ateşman score	Bezirci-Yılmaz score	Required education level	Mean similarity (%)
001	Amputation surgery	46.1	18.4	Postgraduate	54.0
002	Arthrodesis surgery	40.6	19.8	Postgraduate	56.0
003	Intra-articular fracture surgery	38.5	21.6	Postgraduate	54.6
004	Hand fracture surgery	44.4	18.1	Postgraduate	57.2
005	Developmental hip dysplasia and CP sequelae surgery	38.0	21.1	Postgraduate	51.8
006	Carpal tunnel release	42.7	18.3	Postgraduate	57.4
007	Minor orthopedic surgical procedures	39.0	21.6	Postgraduate	53.5
008	Trigger finger release	45.1	16.5	Postgraduate	53.6
009	Total knee arthroplasty	41.6	19.6	Postgraduate	51.4
010	Total hip arthroplasty	42.5	18.5	Postgraduate	53.2
011	Trauma surgery	42.3	20.8	Postgraduate	56.9
012	Tumor surgery	43.9	18.5	Postgraduate	56.5
013	General orthopedic consent	4.8	46.7	Postgraduate	44.1

consent form had the highest Bezirci-Yılmaz score (46.7) (Fig. 2). When the Bezirci-Yılmaz scores of all consent forms were evaluated, it was observed that most required a postgraduate level of education to understand the documents. When word and sentence lengths were examined, it was observed that texts with high Bezirci-Yılmaz scores used long and multi-syllabic words more frequently. In particular, the use of complex medical terminology was more pronounced in general consent forms, trauma surgery consent forms, and intra-articular fracture surgery consent forms.

### Textual Similarity Analysis

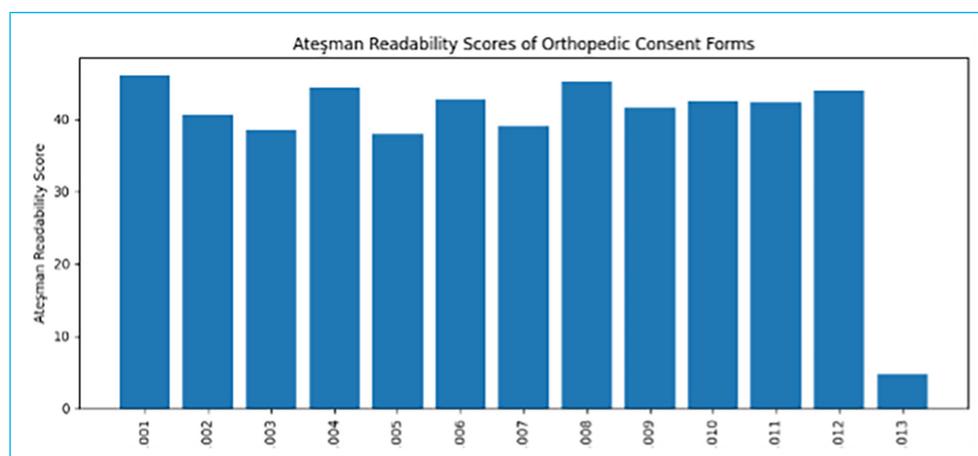
In the textual similarity analysis between consent forms, the average similarity rate was calculated as 53.8%. Similarity rates between documents were found to range from 44.1% to 57.4%. The highest average similarity rate was

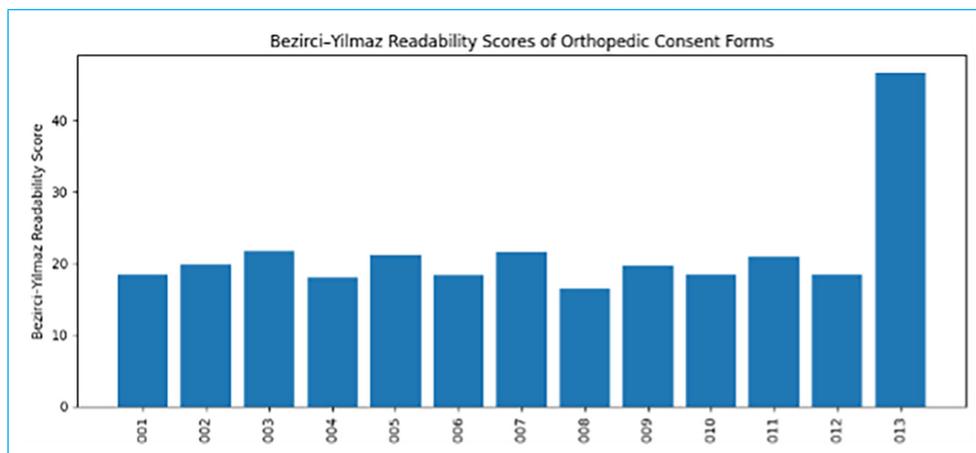
found in the carpal tunnel syndrome surgery consent form (57.4%), while the lowest similarity rate was determined in the general orthopedics consent form (44.1%) (Fig. 3).

In pairwise comparisons, a significant textual overlap was observed between trauma surgery and amputation surgery consent forms. Furthermore, consent forms for arthroplasty surgeries were also found to show a high level of similarity with each other. The consent form for developmental hip dysplasia and cerebral palsy sequelae in pediatric orthopedics showed lower similarity than other documents and differed in terms of procedure-specific content.

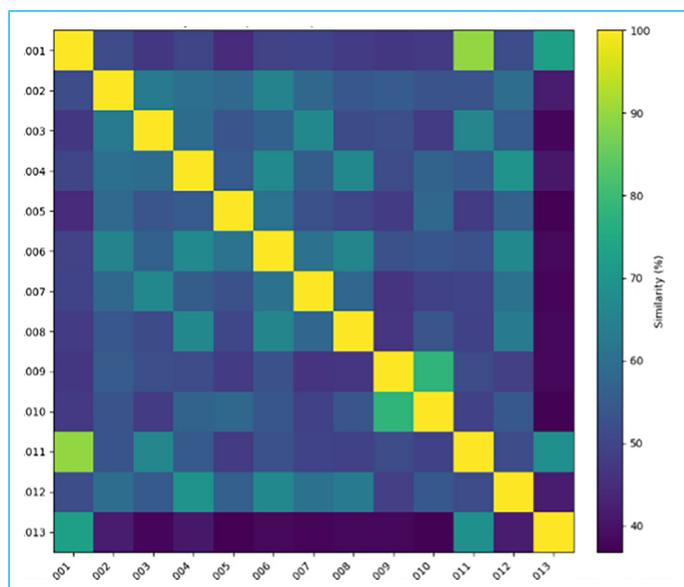
### The Relationship Between Readability and Similarity

When the relationship between textual similarity and readability parameters was evaluated, a strong and statistical-

**Figure 1.** Distribution of Ateşman readability scores across orthopedic informed consent forms.



**Figure 2.** Distribution of Bezirci-Yılmaz readability scores across orthopedic informed consent forms.



**Figure 3.** Textual similarity heatmap of orthopedic informed consent forms ordered by form code.

ly significant positive correlation was found between the average textual similarity ratio and the Ateşman readability score ( $r=0.85$ ,  $p<0.001$ ). This finding suggests that increased use of template texts may improve grammatical fluency.

In the Spearman correlation analysis, a moderate positive relationship was observed between textual similarity and the Ateşman score, but the statistical significance was borderline ( $\rho=0.51$ ,  $p=0.078$ ).

No significant relationship was found between Bezirci-Yılmaz scores and textual similarity. This indicates that although the grammatical fluency of texts has increased, the required level of education for comprehension remains high.

## Discussion

While the readability assessment of patient information materials has been widely studied, the relationship between template-based textual similarity and readability parameters has not been previously investigated in orthopedic informed consent forms. The integration of computational text similarity analysis with Turkish readability indices provides a new perspective for evaluating institutional consent templates.

Our study found that a large proportion of the orthopedic consent forms examined required a postgraduate level of education (Bezirci-Yılmaz scores 16.5–46.7). This situation is seriously inconsistent with the general level of education and health literacy in Turkey. Similarly, a study conducted in Croatia reported that the SMOG score of the forms was 13.25 (university level) and that 80% of the population could not understand these texts. Studies in South Africa and the USA also confirm that consent forms regularly exceed the educational level of patients.<sup>[12–14]</sup>

The fact that our textual similarity rates (53.8%) show a positive correlation with the Ateşman score ( $r=0.85$ ) proves that the use of institutional templates standardizes grammatical structures and increases fluency. However, this standardization does not lower the educational level required for comprehensibility. The literature shows that institutional review boards (IRBs) often fail to meet even their own readability standards (usually 6th or 8th grade). This indicates that it is not only necessary to use templates, but also to rewrite the templates themselves according to the “plain language” principle.<sup>[15,16]</sup>

In our study, it is a positive finding that pediatric orthopedic forms stand out from others by providing procedure-specific content. However, the high similarity in general consent and trauma forms may undermine the principle of “speci-

ficiency of information.” Current legal precedents, such as the *Montgomery v Lanarkshire* case, consider the failure to discuss alternative methods (e.g., conservative treatment vs. surgery) as a lack of information.<sup>[17,18]</sup> Consent forms should not merely be a “list of risks” but a “decision support tool” that the patient can understand.<sup>[1,19]</sup>

According to the literature, readability scores alone are not sufficient; simplification of technical language and keeping the form under 15 pages are recommended.<sup>[20]</sup> Furthermore, the use of visuals to explain complex orthopedic procedures can significantly increase comprehension in patients with low health literacy.<sup>[21,22]</sup> The informed consent texts in our study did not include visuals, but the average page count was 4.8.

A strong positive correlation was observed between textual similarity and the Ateşman readability score. This may suggest that more standardized texts improve grammatical fluency and sentence structure, thereby increasing readability scores. However, higher textual similarity does not necessarily indicate better patient comprehension, as readability indices mainly reflect linguistic structure rather than conceptual clarity.

Literature studies in Türkiye across various specialties reveal that informed consent forms generally require a high level of education and are long and difficult to read. Altın and Yılmaz<sup>[23]</sup> reported that consent forms used in tertiary orthopedic clinics were readable at the high school level, while emphasizing the need for simplification. Similarly, Boztaş et al.<sup>[24]</sup> showed that anesthesia consent forms had low readability in all institutional types and were inconsistent with the average education level of the country. Sönmez et al.<sup>[25]</sup> reported that elective urological consent forms were significantly more difficult to read compared to emergency medicine forms, but both groups were far from being understandable at the patient level. Our current study not only supports these findings but also adds a new dimension to the literature by demonstrating a strong relationship between high textual similarity and readability. Our findings suggest that while the use of templated texts may increase grammatical fluency, it also increases text length and conceptual density, thereby limiting comprehensibility at the patient level. These results indicate that consent forms need to be restructured not only in terms of readability, but also in terms of procedural specificity and textual authenticity.

## Conclusion

This study shows that orthopedic informed consent forms are largely templated and exhibit a structure that is far from being readable at the patient level. The fact that texts averaging 1,720 words take approximately 8–10 minutes to

read and occupy an average of 3–4 pages makes the effective use of these documents difficult in busy outpatient settings. Although there is a relationship between textual similarity and grammatical fluency, a high level of education is still required. Therefore, to increase the effectiveness of the informed consent process, it is recommended that shorter, procedure-specific, simplified, and visually supported information materials be integrated into outpatient practice.

## Disclosure

**Ethics Committee Approval:** This study does not require ethics committee approval as it does not contain patient data or personally identifiable information.

**Informed Consent:** Informed consent was not required for this study because no human subjects were directly involved and no identifiable patient data were used. The study evaluated artificial intelligence-generated responses and expert assessments based on previously developed questions; therefore, informed consent was not applicable.

**Authors' contributions:** Concept – BA; Design – BA, SBY; Supervision – BA; Findings – BA; Materials – BA, SBY; Data Collection and/or Processing – SBY; Analysis and/or Interpretation – BA, SBY; Literature Search – SBY; Writing – BA; Critical Review – BA, SBY.

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**Peer-review:** Externally peer-reviewed.

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