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Image schemas and the semantics of Serbian sports terminology: An innovative approach

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Abstract
The terminology used in specialized areas of study is an essential part of communication among people active in those fields. However, variations in terminology across languages and cultures can hinder communication. This paper aims to outline the potential of using image schema clusters in analyzing (Serbian/English) sports terminology. The image schemas of FORCE <F>, PATH <P>, LINK <L>, and BALANCE <B>, their scalar values, and their corresponding specifiers (<end path>, <cycle>, <up>, etc.) were used to annotate and analyze a group of 140 Serbian language sports terms. An important part of the annotation process was the parsing of the event/movement to determine the number of individual segments included in the performance of each and ascribing to it specific schemas, their level of scalarity, and the appropriate specifiers. The focus was on the dynamic mental simulations of movement in sports, which are described as dynamic events that depict the athlete's body in motion through time and space. The analysis addressed the issue of overcoming non-literal descriptions in sports terminology in favor of conveying the abstract nature of the underlying structures, thus rendering them universal. The findings indicate that the proposed image schema identification protocol can be used to identify the image schema clusters and their scalar values that determine the terms in the corpus. The study contributes to the achievement of transparency and clarity in sports terminology by precisely determining and formulating the meaning of concepts related to specific sports terms, which is essential for unimpeded communication in this area.

Key words: *schematicity*, *image schema, image schema clusters*, *sports terminology*, *Serbian*

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Схемы-образы и семантика сербской спортивной терминологии: инновационный подход

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Аннотация
Терминология, используемая в специализированных областях знаний, является неотъемлемой частью общения между людьми, работающими в соответствующих сферах. Однако ее лингвокультурная специфика может затруднять это общение. Цель данной работы – показать возможность использования кластеров схем-образов в анализе (сербской/английской) спортивной терминологии. Схемы-образы СИЛА <F>, НАПРАВЛЕНИЕ <P>, СВЯЗЬ <L> и РАВНОВЕСИЕ <B>, их скалярные значения и соответствующие спецификаторы (<конец движения>, <круг>, <вверх> и т.д.) были использованы в аннотации и анализе 140 сербских выражений. Важной частью процесса составления аннотаций был анализ события/движения для определения количества отдельных сегментов, включенных в выполнение каждого из них, и приписывания им конкретных схем, их уровня масштабируемости и соответствующих спецификаторов. Основное внимание было уделено ментальному моделированию движения в спорте, представленному как динамическое событие, описывающее действия тела спортсмена при перемещении во времени и пространстве. В ходе анализа был рассмотрен вопрос о преодолении небуквальных описаний в спортивной терминологии в пользу передачи абстрактной природы лежащих в ее основе структур, что делает их универсальными. Результаты исследования показывают, что предложенный протокол идентификации схемы изображения можно использовать для идентификации кластеров схемы изображения и их скалярных значений, которые лежат в основе терминов, включенных в корпус. Исследование способствует достижению прозрачности и ясности в спортивной терминологии, т.е. точному формулированию значения понятий, связанных с конкретными спортивными терминами, что необходимо для беспрепятственного общения в данной области.
Ключевые слова: *схематичность, схемы-образы, кластеры схем-образов, спортивная терминология, сербский язык*

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1. Introduction

The terminology used in specialized areas of study is an essential part of communication among people active in those fields. For instance, Alberts (2014: 6) states that the primary aim of terminology is "to promote communication in scientific and technological environments". In the same text, he specifies that the principles informing the development of terminology are set and include the following: a term always refers to a concept; a term has a precise meaning and reflects the features of the given concept; the concept denoted by the term is always

clearly defined; and finally, a term represents a link between a linguistic representation and a mental construct.

The transparency of meaning, i.e., the precise determination and formulation of the meaning of concepts related to specific sports terms across languages, would contribute significantly to unimpeded communication. Johnston et al. (2023: 1) state that "various undefined or vaguely defined terminologies have been recognized for causing confusion and contradiction in both research and practice". They further acknowledge that

> "[a]mongst a growing field of research and practice in athlete development, it will be paramount for the sake of all stakeholders to remain attentive to the language they use. We believe the field is at a critical juncture where striking a balance between vagueness and conceptual clarity will be a necessity to advance the field forward in the right direction" (Johnston et al. 2023: 4).

This study relies on image schemas to achieve transparency and clarity in sports terminology. To quote Mandler (2007: 81), image schemas are "a representation one is left with when one has forgotten most of the details of an event." They represent an 'abstract starting point' (Dewell 1997) or underlying abstract configuration for analysis, interpretation, or instruction, irrespective of the language medium. At a more abstract level of analysis, image schemas refer to the mental simulations of movement explained as a dynamic event, describing what an athlete's body does while moving through time and space. The main innovation of this study is the application of image schema clusters and their associated values to the study of sports terminology. Current analyses of Serbian sports terminology (see Ilinčić 2019, Milić 2006, Milić 2013, Milić 2015, Ranđelović 2015, Veličković & Janić 2023 inter alia for an overview) are overwhelmingly morpho-syntactic in nature. To date, no studies in this linguistic environment have relied on image schema clusters to analyze sports terminology. Consequently, this study attempts to provide an image schema-based account of objective motion as described by sports terminology, with the aim of avoiding ambiguity in communication.

In sports terminology, clarification is relevant to not only athletes or beginner students, but also laymen who do not know much about the topic but would like to be active in the field. Room (2010) indicated that the use of potentially arcane terminology as well as alternate or colloquial terms which can be confusing are some of the issues that render terminology acquisition more complex. There is also the unavoidable issue of potential polysemy, as in the case of the term *asistencija* (in English: *assist*), which occurs in as many as four different types of sport (soccer, basketball, handball, and water polo), or *lopta* (in English: *ball*), which is found in as many as six different types of sport (soccer, basketball, volleyball, rhythmic gymnastics, handball, water polo) according to the definitions provided in *Englesko-srpski rečnik sportskih termina* (*ESRST*) and *Novi englesko-srpski rečnik sportskih termina* (*NESRST*). In such circumstances, transparency of meaning related to specific sports terms across languages would contribute significantly to unimpeded communication.

Due to the large number of Anglicisms that have made their way into the field of sports terminology, many terms can be opaque in meaning (a *triple double*, a *hat trick*, etc.). As a result, numerous movements or elements in sports are referred to by more than one linguistic term (sometimes one originating from the Serbian language and one borrowed from English; at times by more than one term from each language, as in the case of the Serbian term *savijanje tela unazad* and the term *most* – along with their corresponding English equivalents *backbend* and *backgrab*). To overcome the opaque nature of sports terminology, paying more attention to universals pertaining to meaning and concept structure would be a beneficial endeavor in achieving clarity in sports communication. Descriptions incorporating image schemas could facilitate comprehension both among athletes and laymen, as well as language instructors, researchers, and students in the field.

This study analyzes the application of a newly proposed image schema identification protocol (based on the work done by the Pragglejaz Group 2007) on a small-scale corpus of Serbian sports terminology. The protocol was assessed in order to determine its scope of applicability for the purposes of clarification, representation, and description of the concepts referred to by the analyzed sports terms. The premise of this paper is based on the assumption that sports terminology frequently describes force, spatial relations, and movement. These domains are ideally suited for explanations via image schemas. The main contribution would be to illustrate that image schema clusters, and any of their associated values, can be applied to the study of sports terminology.

The structure of the paper is as follows: section 2 provides an overview of the theoretical background, predominantly outlining the specifics pertaining to image schemas; section 3 describes the methodology implemented in the study; section 4 provides the results of the analysis and the discussion. The paper concludes with section 5.

2. Theoretical background

Image schemas are viewed as 'preconceptual building blocks' (Popova 2005) involved in concept formation. As previously indicated (e.g. Cienki 1997, Hedblom et al. 2015, 2019, Johnson 1990, 2005, 2007, Lakoff 1990a, 1990b, Lakoff & Turner 1989, Mandler 1992, 2007, 2012, Oakley 2007, Popova 2005 among others), image schemas represent abstract, subconscious patterns that refer both to movement through space and to the manipulation of objects/apparatuses at the same time. The structures created with these building blocks require mutual interaction among the image schemas. This is referred to as "grouping" (Cienki 1997), "image-schema families" (Hedblom et al. 2016), or image schema clusters. Johnson (1990) stated that image schemas are linked to dynamic processes and that they require the presence of a conceptualizer who is actively scanning them. To quote, they are "structures *of an activity* by which we organize our experience in ways that we can comprehend" (Johnson 1990: 29, original emphasis) and are "flexible in that they can take on any number of specific instantiations in varying contexts" (Johnson

1990: 29–30). Due to their dynamic nature, their ability to be presented in the form of scalarized values (see subsequent text), and their inclusion in abstract configurations, it is assumed that image schema complexes might be applied to the study of sports-specific terminology (e.g. Atmawijaya 2025, Hedblom et al. 2016, Martín de la Rosa 2023, Pavlović et al. 2024, Silaški & Đurović 2024, Zibin & Solopova 2024). Ultimately, the basic tool of analysis is a discretized system which refers to the concatenation of individual schemas working together to trigger the appropriate dynamic mental simulation of an event, or in this case, a movement.

When it comes to the relationship between the terminology of choice and image schemas in general, Dewell (2005: 371) warns about concluding that image schemas are merely mapped onto lexical units. In fact, the choice of lexemes plays an important role in how image schemas are organized, i.e., clustered. If that is the case, according to the same author, we can account for the occurrence of 'universal similarities' by mapping certain image schema clusters (cf. Cameron & Stelma 2004). To our view, there are reliable indicators which render image schemas suitable tools for the analysis of sports terminology. Image schemas are linked to patterns formed in our subconscious, originating from our interactions with the world around us. This interaction includes our understanding of spatial relations (the layout of the objects around us, our perception of relationships such as *in front of – behind*) and informs the way we navigate through our surroundings (i.e., movement in general) and manipulate objects.

The current study relies on the work done by Evans and Green (2006: 190), who proposed the following eight categories of image schemas: Balance, Containment, Existence, Force, Identity, Locomotion, Space and Unity/Multiplicity. Of these, the following schemas were used in the subsequent analysis: FORCE <F>, PATH <P>, LINK <L>, and BALANCE <B>. Our analysis was also informed by Antović (2018), who concluded that

> "'interrupted and continued movement', just like 'abrupt and linked movement' seem strongly schematically motivated: force, distance and path schemas engender the notion of musical motion, while the antonymic adjectives used by the participants are almost synonymous with the presence or absence of links" (Antović 2018: 63).

Scalarized values of image schemas were included in our analysis following the work of Antović et al. (2023), who superimposed the higher order parameter of scalarity on image schemas to indicate possible variations in their intensities (as they pertain to their occurrence as well as to their mutual interactions).[1] The

[1] Since one of the aims of our study was to outline an additional means of describing particular sports terms by relying on image schemas, the movements being referred to by the terms themselves are viewed solely as a physical representation. The distinctive features indicated by combinations of image schemas are meant to be guidelines for the performance of these movements and do not depend on the level of proficiency of individual performers. The level of success of the execution is not relevant for the annotation of each sports term. The annotations are abstract representations,

conclusion drawn by Johnston et al. (2023: 2) that "it would be beneficial to even consider some terms on a scale or continuum instead of being binary and absolute" also considerably informed this aspect of our study. The ensuing valence is either positive (marked by <+>) or negative (marked by <–>) and can increase or decrease in intensity. This resembles a gradation process, whereby the increased value of a particular schema can be marked as <+>, < ++>, or <+++> and alternatively its decreased value could be expressed with <–>, <– –>, or <– – –>. Specifiers represented another component of our analysis. They indicate movement along both the horizontal and vertical axis (as related to the <P> schema), and are mostly found in pairs: <up> and <down>, <left> and <right>, <forward> and <reverse>, <cycle>, <center-periphery> and <periphery-center>, and <end path>.

Image schemas have the potential to describe the underlying abstract and dynamic structure of various types of movement referred to by the select sports terminology included in the analysis. This could identify what might be referred to as 'prototypical' types of movement that are generally found to repeat/recur in sports. These underlying and recurring patterns, once identified and described by means of image schema clusters and their scalar values, should facilitate both the instruction process and the retention process of this particular terminology.

Based on the aforementioned, the following research hypotheses were formulated:

1. As sports activities lead athletes to lose and/or regain their balance during the performance of a particular movement, and to establish physical contact with an apparatus and/or the surface, no differences in terms of frequency of occurrence are expected for the <L> and <B> schemas due to the nature of sports activity in general.

2. Since greater force is required for certain types of movement, in part due to repetition, the scalarized <F> schema will occur more frequently than the scalarized <P> schema.

3. Due to the specific nature of most of the movements analyzed in this study, the non-scalarized version of the <F> schema will occur more frequently than any of its scalarized versions.

4. Due to the nature of human movement in general, the most frequently occurring specifiers will be <up> and <forward>.

3. Data and methods

3.1. The sample of sports terms

The corpus of sports terms was extracted from the *ESRST* and *NESRST* dictionaries. It numbered 140 Serbian sports terms[2]. The selection process was

invoking a perfect and complete performance, as outlined in the two dictionaries of sports terms referred to in this study.

[2] The complete list of the 140 annotated and analyzed Serbian sports terms is available upon request from the authors.

carried out carefully to include different types of movement performed by a single individual moving in isolation (establishing no contact with others, as in martial arts for example, and no contact with equipment, such as a baton or a ribbon). The selected terms were predominantly nouns or noun phrases, with the exception of *odskočiti*, *odskakati*, *odskok*SER. / *bounce*ENG. and *driblati*, *voditi loptu*, *voditi loptu sa fintom*SER. / *dribble*ENG.. However, since one of the Serbian synonyms for the former is a noun, *odskok*, and the latter is usually used interchangeably with *dribbling*, the corpus predominantly consisted of nouns. None of the items included in the analysis are the authors' personal translations. They were all extracted from the aforementioned dictionaries as is. In instances of multiple entries for one term, the first was taken into consideration.

Sports terms which referred to phases of movement or positions of the body that were meant to be held for a certain period of time were excluded, as they required no movement. Further exclusion criteria encompassed any reference to the location where the sport is played (a pool, a field, a track, pitch, etc.), the equipment that the athletes wear or carry, the equipment used in various sports, etc. No attempts were made to include an equal number of terms from every sport during the selection process, as that fell outside the scope of the paper.

The sample is semantically transparent, homogeneous, albeit not extensive. Since this study represents a first attempt at an image schema-based analysis of sports terminology for the purpose of instruction, we believe that extending the sample size can be achieved in the later stages of analysis, that is, once this type of annotation has been tested for its practical applicability.

3.2. The proposed image schema-based analysis

An important part of the annotation process was the parsing of the event/movement for the purpose of interpretation. The individual segments included in the performance of each element/movement denoted by the sports term were determined, to which specific schemas (as discrete elements) and appropriate specifiers (for clarification) were ascribed. The mutual (dynamic) interaction between the schemas was noted, as was their level of scalarity (a measure/consequence of their dynamicity), as in Antović et al. (2023). Additional steps included determining the duration or possible repetitions of the segments, any potential disruptions to the flow of movement, and whether the entire body of the athlete is involved in the movement. Each of the 140 sports terms were manually annotated individually. Both authors took part in the annotation process, acting as raters and evaluating each other's work over several discussion sessions. The relevant combinations of schemas and specifiers were presented in the specific order in which they were perceived to occur during the performance of the elements denoted by the selected terms. In addition to the dictionary definitions, further means of clarification of the given movements included video recordings readily and widely available on various online platforms. The movement of any apparatus was not annotated.

The first step was to determine the image schema combinations and their scalarity. To begin with, it was assumed (cf. Antović 2018, Antović et al. 2023) that PATH and FORCE underlie any movement. The values of scalarity dictate that FORCE varies in terms of intensity and PATH entails progression along successive points. FORCE has the ability to change during the course of movement or the completion of an element, depending on whether more or less energy is consumed, just like PATH undergoes changes depending on the distance traveled during the execution of an element. If a particular movement was repeated several times, the FORCE schema received higher scalarized values. The was also the case if the performance of the element itself required considerable force. For example: *demi-plije*SER./*demi-plie*ENG. was annotated with only <F> considering that the element involved the lowering of the body to a squat-like position, while the elements such as the *naupor jašući* SER. / *straddle glide*ENG. and *makazice s okretom* SER. / *scissors leap*ENG. were annotated with <F++> due to the fact that they require more than one movement and considerable force to perform. The <–> value was not assigned to either schema due to the fact that voluntary force was produced by each athlete in order to complete the assigned element.

A particularly striking feature of the PATH schema is its internal complexity. There is an implied or perceived beginning and an end to the movement, always associated with a resulting state, which can in some instances even be the focus of the entire movement. This schema was scalarized if the athlete moves away from their initially assumed position during the performance of an element. The scalarized value depends on the length of the path crossed (depending on where the athlete begins the performance of a particular element, as opposed to where they end it). For example, the aforementioned *demi-plije* SER./*demi-plie*ENG. was annotated with just a <P> since the athlete did not move from their initial position. Among the elements whose annotations included <P+> we find *plivanje nazad u odbranu*SER. / *drop*ENG. (where a player moves across the swimming pool), which requires that the end position not be the initial one.

BALANCE only has a <–> value (a negative valence) as the schema is used to indicate a change in balance, the disruption of what can be named the 'default' position of the human body and its center of gravity. The <B–> schema was included in an annotation if the body of the athlete rotated around either the horizontal or vertical axis, and if the performance of the element itself ended with the athlete standing on one foot. This encompassed the performance of rolls of various kinds, as well as jumps and elements where the athlete had to spend a certain period of time upside down. In other words, this referred to any and all situations where the athlete was not standing upright with both feet on the ground, arms to the side, facing forward. Serbian terms most commonly associated with the use of the <B–> schema included: *luk* (*izrazito uvinuće, luk*SER. / *arch position*ENG.) and *poskok* (*poskok raznožno*SER. / *jumping jack*ENG.). At the same time, <B> indicated that the athlete had regained balance, either in the middle or at end of a movement.

The LINK schema was used to indicate a direct physical connection between the athlete and an apparatus, or in instances of disturbed balance, the floor. The scalarized value <L+> was added to the annotations of terms such as in *zaklon-most raznožno-stav na jednoj nozi* / *zaklonom kroz most raznožno do stava na jednoj nozi*SER. / *back walkover*ENG. (<F+><P+><spec><down><spec><reverse><spec><end path><L+><B–>). In certain annotations, there were repetitions of the <L–> and <L+> scalarized schemas, which indicated that the athlete both lost and reestablished physical contact with an apparatus during the performance of the element, as in *kaskada*SER. or *cascade*ENG. (<F><P><spec><up><L–><L+><spec><end path>). It was also implicitly inferred that balance was restored upon completion of the event.

Just like <F> and <P> , the <end path> specifier also presents a staple of the annotation process of sports terms. It was included in the annotations only when the final position assumed indicated the completion of movement. It was also used to indicate a pause/break in the movement meant for preparation, i.e., an attempt to gain momentum. This accounts for its increased frequency of occurrence.

The <cycle> specifier was expanded to include two additional variations added by the authors for the purpose of this study. This was done to provide clear and accurate annotations for movements involving rotations of 90° and 180°. The decision to do so was made based on the complexity of the movements denoted by the selected sports terms. The view adopted for the analysis of this specifier was that of Cienki (1997), who presented CYCLE as an image schema, one closely related to that of PATH. Specifically, movement in cyclical form implies following a path that returns to its point of origin, thereby implying iteration, set in motion by FORCE.

Instances when the extremities of the human body moved closer to or further away from the body's center of gravity were annotated using the <center-periphery> or the <periphery-center> specifier. The remaining specifiers clearly indicate the direction of movement of the body: the specifier <up>, the specifier <down>, the specifier <forward>, and the specifier <reverse>.

4. The results

What follows is an overview of the results for the frequency of occurrence of individual schemas and all their noted combinations in the corpus (Figure 1) as well as the frequency of occurrence of the specifiers noted in the corpus (Figure 2).

As can be seen from Figure 1, the most frequently occurring individual schemas in the provided annotations were <F> and <P>, as was their mutual combination. The <B> schema occurs more frequently than the <L> schema, which results in the following frequency of image schema clusters in descending order: <F><P><B>, <F><P><B><L>, <F><P><L>.

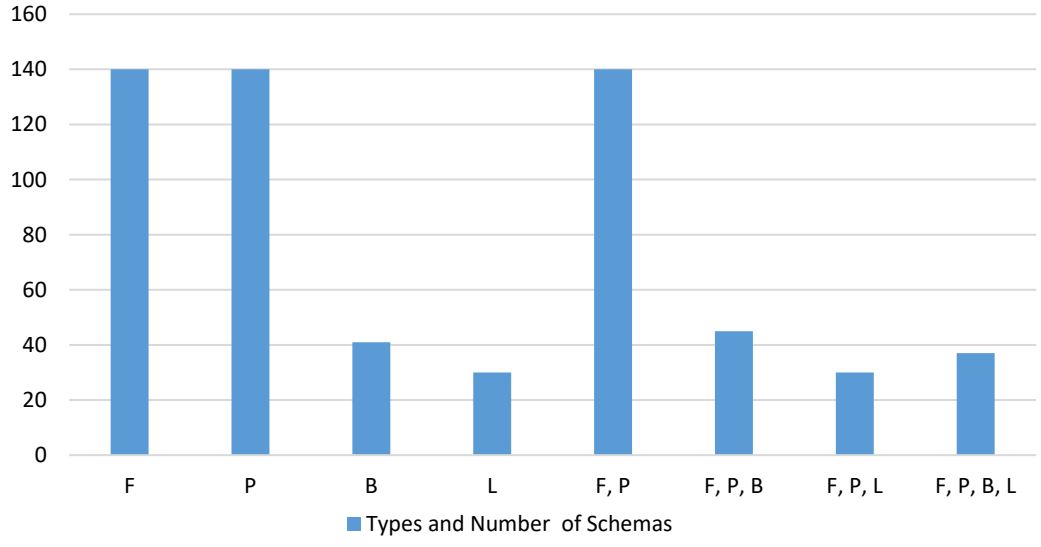

Figure 1. The frequency of occurrence of the annotated schemas, without reference to scalar values or number of repetitions of the schemas themselves in the individual annotations
Source: the authors

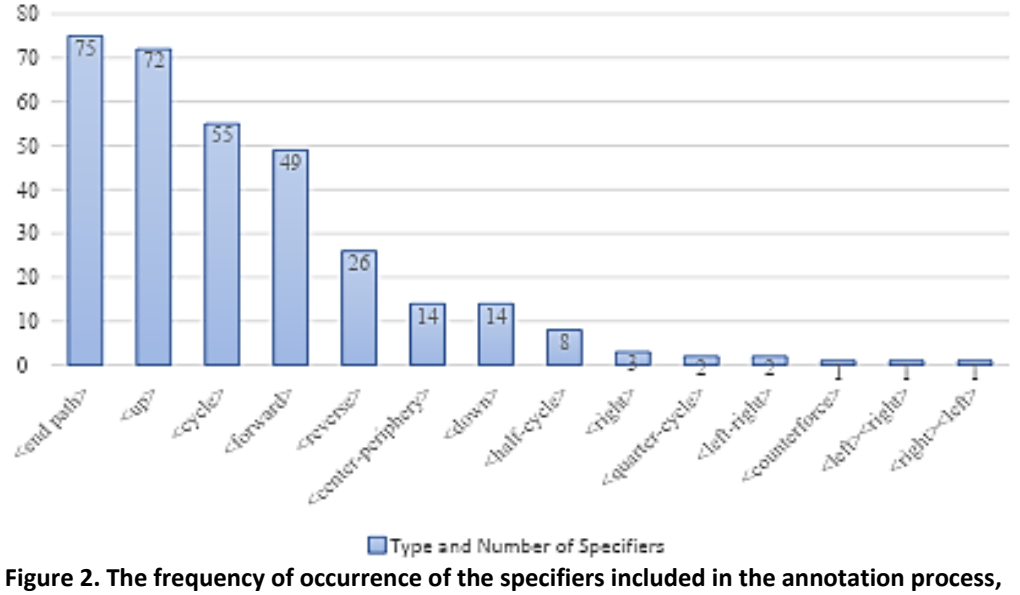

Figure 2. The frequency of occurrence of the specifiers included in the annotation process, irrespective of the number of occurrences in individual annotations
Source: the authors

As can be seen from Figure 2, the most frequently occurring specifier was <end path>, followed by <up>, <cycle>, <forward>, and <reverse> in descending order. When it comes to the remaining specifiers, their frequency of occurrence ranges at approximately ten percent or less.

4.1. An analysis of the mutual combinations of the given scalarized schemas and specifiers

In the following sections, we analyze the schema clusters organized in increasing order of complexity, i.e., the number of schemas contained in the cluster. This section also includes an analysis of the noted specifiers and their combinations.

In terms of scalarity, the types and frequency of the various scalarized image schema combinations can be found in Figure 3 and Figure 4 below. The former represents the scalarized combinations of one of the two most frequently occurring image schema clusters (<F><P><L>), while the latter represents the scalarized combinations of the second most frequently occurring image schema cluster (<F><P><B>).

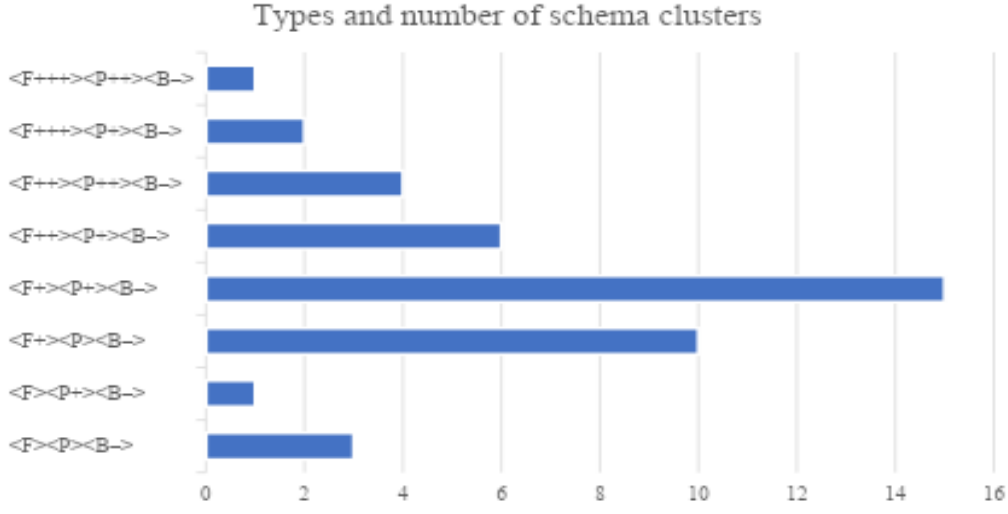

Figure 3. Scalarized values of the <F><P><B> image schema cluster

Source: the authors

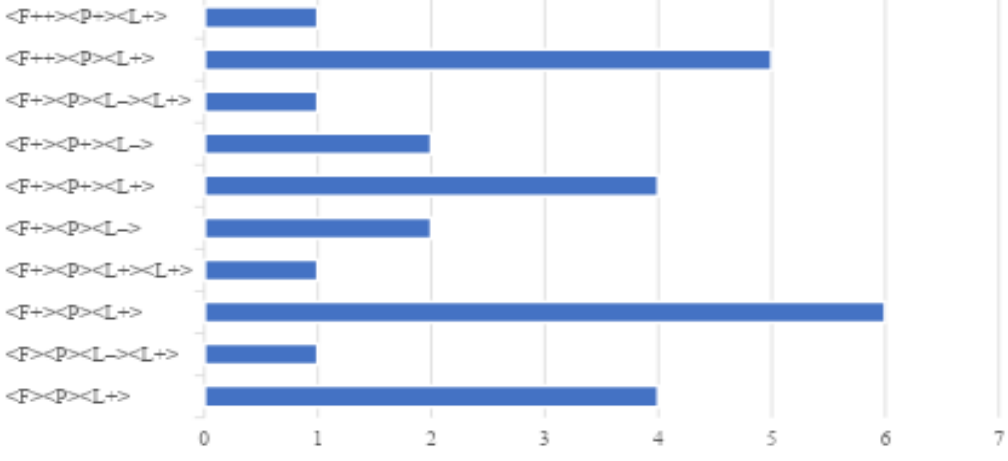

Figure 4. Scalarized values of the <F><P><L> image schema cluster

Source: the authors

A more detailed analysis of each image schema cluster can be found in the following subsections of the paper (<F><P><B> in subsection 4.1.2. and <F><P><L> in subsection 4.1.3.).

4.1.1. The <F><P> image schema cluster

The basic schema cluster on which all the annotations in this study are based is <F><P>, as stated in the theoretical background section to this paper. In total, the (non-)scalarized schemas in this cluster made up 25% of the overall number of clusters.

The frequency of occurrence of specifiers for this schema cluster points to the complexity of the movements referred to by the analyzed sports terms. They involved rotations along the vertical axis, as exemplified in the frequent occurrence of the <cycle>, <up>, and <down> specifiers, as well as movements along the horizontal axis, illustrated in the frequent occurrence of the <forward> and <reverse> specifiers. Among this particular combination of schemas, there was an instance where more than one rotation was noted within the same movement (*flifis*$_{\text{SER.}}$/*fliffis*$_{\text{ENG.}}$). There were also instances where solely movement of the lower extremities was recorded along the horizontal axis (*makazice s okretom*$_{\text{SER.}}$ / *scissors leap*$_{\text{ENG.}}$).

Considering that the <F><P> cluster is found in each of the annotations, the remaining three subheadings will focus mostly on the remaining schemas that were also included in the clusters, namely, the <B> and the <L> schemas.

4.1.2. The <F><P><B> schema cluster

The most frequently occurring cluster, <F+><P+><B–> (10.71%), describes a complex element. It consists either of several movements or requires the repetition of a single movement with a loss of balance, indicating loss of contact with the ground. Examples include *salto nazad*$_{\text{SER.}}$ / *back flip*$_{\text{ENG.}}$. The second most frequently occurring cluster, <F+><P><B–> (7.14%), describes another complex element, but one in which the body of the athlete does not travel through space, such as *izrazito uvinuće*$_{\text{SER.}}$ / *arch position*$_{\text{ENG.}}$. The third cluster, <F++><P+><B–> (4.29%), describes an element that requires considerable force, as implied by the scalarized value of <F>, and includes a range of movements or their repetition. Examples include: *skok udalj*$_{\text{SER.}}$ / *long jump*$_{\text{ENG.}}$. It is for this schema cluster that we noted the highest scalarized value for the <F> schema, <F+++>, included in the annotation for the term *salto s okretom od 540°*, *rudi*$_{\text{SER.}}$ / *full layout*$_{\text{ENG.}}$. As it requires rotations of up to 540°, it was deemed pertinent to indicate the high level of voluntary energy that is discharged in order to perform this element.

4.1.3. The <F><P><L> schema cluster

The <L+> schema occurred in annotations where the athletes establish hand contact with the surface (*kovrtljaj u uporu*SER. / *hip circle*ENG.) or an apparatus (*driblati*, *voditi loptu*, *voditi loptu sa fintom*SER. / *dribble*ENG.), while <L–> was used to indicate avoidance or loss of contact with the surface (*eksplozivni sklek*SER. / *explosive push-up*ENG.) or apparatus (*prelazak (prepone)*, *uspešan prelazak (prepone)*SER. / *clearance*ENG.). Examples of the most frequent scalarized image schema cluster (<F+><P><L+>, 4.29%) include elements where the athlete performs a complex movement which requires contact either with the ground or an apparatus: *veleobrt nazad, velekovrtljaj nazad*SER. / *back giant*ENG., *kovrtljaj u uporu* SER. / *hip circle*ENG., *dropkik*SER. / *drop kick*ENG., among others. The second most frequently occurring cluster is <F++><P><L+> (3.57%), which indicates a similar, yet slightly more complex movement, as in *mađar*, *okret mađar*SER. / *Magyar*ENG. or *podmetni spad* SER. / *underswing* ENG.. The third most frequent schema clusters are <F><P><L+> and <F+><P+><L+> (2.86% each), which indicate similar movements with an increase in complexity, i.e., movements which required physical relocation in space: such as *švedski pad* SER. / *Swedish fall*ENG..

4.1.4. The <F><P><B><L> schema cluster

This schema cluster accounts for 26.4% of all the annotated items. The inclusion of all four schemas indicates that the annotated elements include a complex movement, contact with the floor or apparatus, as well as a disruption of balance during the movement. These clusters at times include more than one occurrence of the <B> and <L> schemas, as in *zanjih poskokom u stoj na šakama* SER. / *back toss*ENG.. Considering that only <B–> was noted in the corpus, this means that the prototypical schema cluster would be <F+><P+><L+><B–> (with an occurrence rate of 46% in the entire corpus).

In accordance with the guidelines pointed out for the <BALANCE> schema, it was not surprising to find that the specifiers occurring most frequently with the scalarized <B–> value would be <up> and <cycle>. Any other specifier combinations mostly had to do with changes along the vertical (<down> instead of <up>) or the horizontal axis (<reverse> instead of <forward>).

The scalarized <F><P><B–><L+> cluster mostly occurred in combination with three specifiers: <end path>, <cycle>, and <forward>. Based on the aforementioned finding that <L+> implies direct physical contact, while <B–> implies a change in the body's center of gravity, the types and frequency of the specifiers is not surprising. The main reason is that they indicate various rotations mostly along the horizontal axis (*dotik*, *kovrtljaj bez dodira telom*SER. / *clear hip circle*ENG.) and to a lesser extent along the longitudinal axis (*kovrtljaj nazad do stoja na šakama sa iskretnim ramenima*SER. / *basket with inlocation*ENG.).

To facilitate comprehension, we have provided a visual representation of one of the annotated terms, the *salto napred*SER. / *forward somersault*ENG. (see Figure 5).

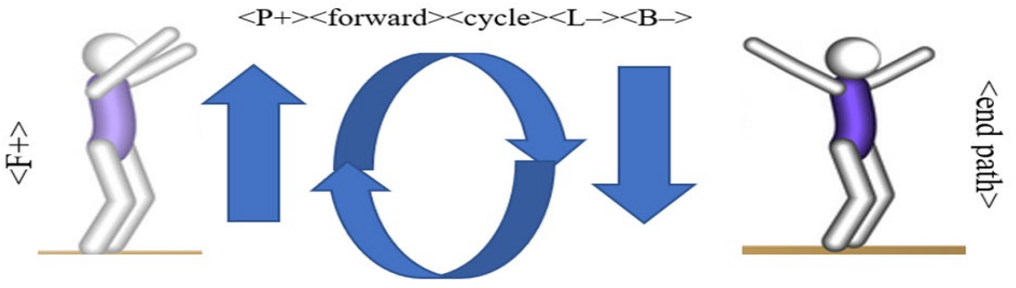

Figure 5: A visual diagram of the term *salto napred*$_{SER.}$ / *forward somersault*$_{ENG.}$ with added representations of image schemas and specifiers
Source: the authors

5. Discussion

In the case of the <L> and <B> schemas, it was determined that <B> occurred with a greater frequency than <L> (at a ratio of 41:30), which was also reflected in the image schema clusters (<F><P><B> occurred 32.14% of the time, while <F><P><L> occurred 21.43% of the time). This comes down to the nature of the sports activity: it was more often the case that athletes lose and regain their balance during the performance of a specific movement than establish physical contact with an apparatus and/or surface. Therefore, we might be able to further expand the idea put forth by Antović (2018), who indicated that movement is essentially represented by the <F><P> cluster. Based on our findings, it would seem that human movement is more accurately described by an <F><P><L><B> cluster.

This conclusion is further borne out by the fact that approximately one-quarter or our annotations included this particular cluster. Thus, hypothesis 1 was not confirmed. In the case of clusters containing the <B–> schema and the (non-)scalarized <L> schema, the former occurred most frequently with the specifier <up> (33 instances), and to a lesser extent with the specifier <cycle> (10 instances). This is not surprising considering that following a disruption in balance, usually indicating a movement down or sideways, the athlete would attempt to pull themselves up, or alternatively would have initiated the disruption in balance themselves in order to begin a circular movement. For the (non-)scalarized <L> schema the pattern is the same, but with fewer instances, 7 and 5 respectively. These would be instances where the athlete established contact with either the surface and/or an apparatus in order to propel themselves upward, or begin a circular movement. In the <F><P><B><L> cluster, we find the frequent occurrences of the <B–><L+> combination, usually associated with a preparatory period prior to the execution of a complex movement. This claim is backed by the considerable presence of the <up>, <cycle>, and <forward> specifiers in the annotations. However, the <B–><L–> cluster was far scarcer among the results and was mostly linked to the <end path> specifier, indicating an overall end of motion, letting go of any apparatus, and re-assuming a fixed, upright position.

When it comes to the scalarized versions of the <F> and the <P> schemas, hypothesis 2 was confirmed in that the former occurs more frequently than the latter. Specifically, in image schema clusters which contain the <B–> schema, the scalarized values of <F> range from <+> to <+++>, while the scalarized values of <P> range from <+> to <++>. It would seem that annotations which include both <F++> and <P++> always co-occur with the <B–> schema. The annotated terms in this case mostly refer to kinds of movement that involve rotations around the horizontal or the vertical axis. The same pattern recurs in the image schema clusters containing the <L> schema, wherein the scalarized values of <F> range from <+> to <++>, while those of <P> solely include <+>. One of the reasons for this is that greater force is required for specific types of movement, as well as for movement repetition, even if the athlete does not traverse along a path. It is possible for a movement to be forceful but also to be completed in the same space/location. All of the occurrences of <F+++> coincided with the occurrences of <P++> in specific situations which required the performance/completion of more than one somersault, but did not require the athlete to actually move from their initial starting position. The value of the force exerted, as indicated by the scalarized values of <F>, provided the needed space to account for more complex movements.

When it comes to the occurrence of (non-)scalarized versions of the <F> schema, the non-scalarized value of <F> occurred 24 times (17.14%), while the scalarized versions occurred with the following frequencies: <F+> 91 times (65%), <F++> 22 times (15.71%), and <F+++> 3 times (2.14%). Therefore, hypothesis 3 was not confirmed, in that non-scalarized <F> and scalarized <F> occurred at a ratio of 25:115, i.e., the scalarized versions of the <F> schema occurred 4.5 times more frequently. This finding might be ascribed to the fact that the corpus contained a large number of complex movements that required the exertion of more than a little force. Of the 140 annotated items, 27 (19.29%) involved some form of jump (*po-*/*na-*/*do-skok*), 16 (11.43%) involved turns, and 14 (10%) involved saltos, which together make up 40.72% of all the annotated items. These are complex turns that include rotating around axes, both horizontal and vertical, as well as movements that require takeoff from a surface that is not necessarily the ground, requiring force to propel the body through the air and counteract the force of gravity. Therefore, scalarized versions of <F> were expected. What is surprising is the ratio between the <F+> and <F++> schemas, whereby the former is four times more frequent than the latter, irrespective of the potential conclusion that complex or repetitive motions would be more frequent. In addition, a considerably greater number of specifiers were found to accompany scalarized versions of the <F><P> cluster. In this instance, scalarity in combination with a greater number of specifiers indicates a more complex movement. Among the non-scalarized clusters, the most frequently occurring specifier was <up> with 9 instances, and among the scalarized, <cycle> with 6 instances.

Interestingly, the frequency of occurrence of the two most frequent specifiers, <up> and all the versions of <cycle>, depends on the type of cluster, irrespective of

scalarity. For example, in the <F><P><B> cluster there were 30 instances of <up> and 22 of <cycle>. Considering that <B–> was the only noted scalarized value, the frequency of occurrence of <up> may come as no surprise. Considering the disruption in balance, the presence of the <cycle> specifier might also be expected, as <B–> was used to annotate rotations. In the <F><P><L> cluster, <up> occurred 11 times and <cycle> 12 times. And in the <F><P><B><L> cluster, <up> occurred 16 times and <cycle> 23 times. This might lead us to conclude that a potential link exists between the <B–> schema and the <up> and/or <cycle> specifiers.

Hypothesis 4 was confirmed in part, considering that the specifiers <up> and <cycle> occurred with a frequency of 72 and 55, respectively, outranking <forward> (49 instances). However, ultimately the most frequently occurring specifier was <end path> (75 instances). It was included in the annotations only when the final position assumed indicated the end of movement, i.e., its completion. It was also used to indicate a pause/break in the movement meant for preparation, i.e., an attempt to gain momentum. This is why its occurrence is considered a staple in the annotations. The second most frequently occurring specifier was <cycle>, with a frequency of 55. The nature of human movement in general (a body heading forward, or as the case may be in sport, moving up) rendered the hypothesis a logical initial starting point. However, the fact that many of the sports terms included in the corpus were actually drawn from sports terminology specific to gymnastics and gymnastics elements in general may have skewed the results in favor of the <cycle> specifier.

Based on these findings, what might have initially been assumed to be a prototypical movement (a movement up and forward, exerted with additional force as it required rotation, but one which would not require the athlete to traverse along a considerable path) may not entirely be accurate. The occurrence of the <B> and <L> schemas have not fully been taken into consideration. It appears that it is not the <F> schema or its scalarized values that determine the complexity of a movement or element, but that it is the scalarized values of the <L> schema which indicate a complex group of movements (including grabbing and releasing) during the execution of a single element. The number of specifiers that accompany these clusters could be taken as another indicator of complexity. The <F><P><B><L> cluster included one to six specifiers, most often three (18 or 48.64%), suggesting its status as the ‘underlying’ cluster describing human movement in general.

Considering the fact that our corpus was extracted from existing terminological dictionaries, and the fact that our analysis was carried out with the aim of making a contribution to facilitating comprehension in what could be referred to as sports communication, we believe that one of the implications of our findings is that they could be added to existing dictionary definitions in order to enrich them. More broadly speaking, these findings could make a contribution to the field of terminography. Our idea is that the enrichment could be twofold: on the one hand, below each dictionary definition, we propose to add the annotation of the term itself, one which would include both image schemas and the specifiers, as needed. The

symbols necessary for interpretation of the annotation would be included in the list of abbreviations and symbols used in the dictionary itself, at the very beginning of the volume. The annotation would be followed by a brief description, which would describe the intended meaning. What would then ensue would be the dictionary definition itself. For example, we provide a sample of how this might be done for term *most napred*$_{\text{SER.}}$, *premet napred jednonožno i bez faze leta*$_{\text{SER.}}$ / *front walkover*$_{\text{ENG.}}$:

<F++><P+><spec><forward><spec><down><spec><up><spec><end path><L+><B–>

This movement requires a certain amount of additional force to perform, considering that it involves moving forward, a handstand position (which requires a disruption in balance, i.e., the athlete will no longer be assuming the initial upright position), and then requires both hands and both feet to make contact with the surface, before once again assuming the upright position.

6. Conclusion

The aim of this study was to assess the possibility of analyzing a small-scale corpus of Serbian sports terms (for which their English counterparts were provided) by means of an image schema identification protocol, in order to address the issue of the comprehension and representation of the movements/elements referred to. The focus was on the dynamic mental simulations of movement in sports explained as dynamic events, describing what the athlete's body does while moving through time and space. The analysis addressed the issue of overcoming non-literal descriptions in sports terminology in favor of conveying the abstract nature of the underlying structures, thus rendering them universal. The findings outlined in this paper indicate that it is possible to use the proposed image schema identification protocol to identify the image schema clusters and their scalar values that underlie the terms included in the corpus.

The findings indicate the absence of excessive use of force, which is accompanied by moderate movement in relation to an initial starting point. The perceived core of the analyzed movements and motions seems to be a controlled loss of balance and establishing and losing contact with the surface and available apparatuses. Thus, the prototypical movement is not solely that of moving up, which emerged as the primary direction of movement, and not even by extension moving forward, but also engaging in rotations around an axis and (re)establishing contact with hard objects and surfaces. This provided us with a more detailed image schematic description of human movement in sports, one that extends beyond the initial assumption of a two-schema cluster to a four-schema cluster instead. Based on the existing and predetermined terminological principles, it may even be possible to add the results of the protocol analysis to existing dictionary definitions, working within the set parameters that meanings and descriptions are meant to be concise and aim to grasp the essence of a term. The potential for enriching dictionary definitions could be considered an additional contribution of this paper.

In terms of drawbacks and limitations, one of the pressing issues encountered by the annotators was how to present the order of the schemas and specifiers. This was particularly prevalent when determining how to differentiate between situations where only one part of the body is moving as opposed to the entire body itself. This is a point that does require further study. A potential issue may also have been that the majority of sports terms included in this analysis originated from the field of gymnastics.

Specific analyses of sports terms related to particular fields may be warranted in the future, for purposes of comparison. The study contributes to the achievement of transparency and clarity in sports terminology which is essential for unimpeded communication.

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CRediT authorship contribution statement

Janić Mitić: Conceptualization, Data collection, Data analysis, Writing – original draft and revision; Critical revision of the manuscript; **Veličković:** Conceptualization, Data collection, Data analysis, Writing – original draft and revision; Critical revision of the manuscript, Proofreading.

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