Introduction

Verbal prefixation in Slavic languages is a good example of a phenomenon that remains largely mysterious, despite its having received considerable attention in linguistic literature. The variety of functions that the prefixes fulfill and the range of semantic contributions they can make cause one to wonder whether any kind of systematic pattern underlies their behavior. Is their attachment subject to any kind of uniform semantic system?

Prefixes can contribute spatial, temporal, quantificational and aspectual meanings. In some cases, their contribution is idiosyncratic or at least is so largely lexicalized that it is even difficult to classify it as falling under any independently defined group. As a brief illustration, consider the contribution of the Russian prefix *pod-* in the following verbs: *podbežat* (*pod*-run) 'approach by running', *podsušit'* (*pod*-dry) 'make somewhat drier', *podbrosit'* (*pod*-throw) 'throw up', *podpet'* (*pod*-sing) 'accompany in singing', *podsmotret'* (*pod*-watch) 'peep'. If even these uses of a single phonological prefix are so difficult to unify, what can be said about unifying distinct prefixes?

Despite the superficial diversity illustrated above, many researchers believe that a system does, in fact, exist behind the semantic behavior of prefixes. For instance, this view is taken, to different extents, by Jakobson (1984), Janda (1985, 1988) and Paillard (1997), among others. The desire to provide verbal prefixes with a unified approach is motivated by the fact that numerous systematic patterns can, in fact, be observed in the functions of the prefixes, notwithstanding the apparent variety. This view is further supported by the productivity exhibited by many of the prefixes, for instance, when attached to recently borrowed verbs, and by the ease with which native speakers of Russian interpret the new prefixed items.

The goal of this book is to develop a unified approach to Russian verbal prefixes. The proposed approach explicitly describes the semantic system that underlies the attachment of prefixes, specifying both the core meaning that unifies them and the parameters by which prefixes and their uses differ from one another. For this purpose, I will employ degree semantics, with the concepts of *scales* and *degrees* playing a central role in the analysis.

Considerable attention has been devoted in recent literature to the role of scale structure within the verbal domain. It appears that numerous kinds of eventualities can be conceptualized as involving progress along a scale. For instance, an event of walking to the store involves progress along a path scale, an event of cooling the soup consists of a change along a temperature scale, and an event of growing constitutes an increase along a scale of size. Verbal prefixes, as I will argue, systematically apply precisely to such scales, typically the ones that are independently contributed by their environment (although in much rarer cases a prefix may itself contribute a scale). They apply to path scales (which result in spatial meanings), time scales (creating temporal meaning), volume/extent scales and a wide range of property scales. All these types of scale dimensions have been discussed in the literature on scalarity in the verbal domain (e.g. Kennedy and Levin 2002, Součkova 2004a, b). I investigate the nature of scalar meanings contributed by verbal prefixes and the ways in which these meanings interact with the semantics of the linguistic environment. I further consider in detail a number of individual Russian prefixes and see how the semantics of each falls under the more general scalar pattern. This investigation will allow us to state with much precision both which properties unify distinct prefixes and their sub-uses and by which properties they are contrasted. I will also list attested values for those parameters by which prefixes are distinguished.

Assuming the scalar nature of Russian prefixes, their investigation contributes to our understanding of a more general and cross-linguistic topic, the role of scale structure in the verbal domain. Given that we are dealing with numerous prefixes, which can apply to verbs of different aspectual and lexical semantic classes, their study can tell us a lot about those scale-related notions to which verbal semantics is sensitive. Therefore, one goal of the present study is to investigate the nature of verbal scalarity, and to compare it to the longer-studied scalarity within the adjectival domain.

The book is organized as follows. Chapter 1 introduces the problems to be dealt with and the general hypothesis regarding the semantics of verbal prefixes. I begin the chapter by discussing the basic terms and notions of degree semantics and those questions that are raised when the scalar approach is applied to the verbal domain. Then I turn to Russian verbal prefixes, introduce the questions that are raised by their heterogeneous nature and propose a scalar approach to their semantics, referred to below as the Scale Hypothesis. I also discuss some properties of verbal prefixes that deserve attention, despite their not being directly related to their scalar nature.

The following four chapters are devoted to a detailed discussion and analysis of individual prefixes. The prefixes are given an account within the framework of the Scale Hypothesis. It is shown how the different uses of the prefixes are unified under this approach, and also by which properties they can be distinguished. Chapter 2 concentrates on three prefixes that apply to a specific kind

of degree, namely, the degree of change argument of the event. These are the prefixes *po-*, *na-* and *pro-*. In addition to discussing Russian data, I also relate to the prefixes *po-* and *na-* in Czech, on the basis of their analysis in Součkova (2004a, b). In Chapter 3, the Russian prefixes *do-*, *nedo-* and *pri-* are analyzed. These prefixes do not measure the degree of change, but rather apply to the maximal degree that is reached in the course of the reported eventuality (*do-* and *nedo-*) or restrict the degree that is linked to the result state of an eventuality (delimitative *pri-*). Chapter 4 discusses the prefixes *pod-* and *pere-*, which are especially challenging since each of them has a wide range of intuitively different sub-meanings. The chapter therefore illustrates the usefulness of the scalar approach, by showing how it allows us to come up with a unified picture despite the complexity of the data. Chapter 5 is devoted to the prefixes *ot-* and *za-*. The discussion of the latter is based on Braginsky's (2008) analysis. Building on Braginsky's approach, I argue that this prefix, too, conforms to the Scale Hypothesis. Chapter 6 involves a brief and somewhat less formal discussion of several additional prefixes. It relates primarily to a range of prefixes whose application is considerably restricted by various factors; the goal of the chapter is to demonstrate that such prefixes, too, are subject to a scalar analysis. The prefixes discussed in this chapter include *pred-*, *pre-*, *v-*, *nad-*, *niz-*, *de-*, *dis-*, *vz-* and *iz-*. In Chapter 7, a detailed uniform picture is created on the basis of the material from the preceding chapters. I discuss in detail the range of parameters by which prefixes and their uses can be distinguished and provide a list of values for each of these parameters. A number of generalizations and rules are formulated that govern the behavior of prefixes, as far as their interpretation and attachment are concerned. The goal of the chapter is to demonstrate how both the unity and the diversity that characterize the semantics of verbal prefixation can be captured within the framework of the Scale Hypothesis.

Chapter 8 is devoted to a curious phenomenon whereby the presence of certain prefixes interacts with the case of the object. We will see that with some prefixes, the likelihood of genitive case assignment to the direct object is increased. Moreover, the semantics of sentences with genitive objects differs in unexpected ways from the semantics of their counterparts with accusative complements or with no object at all. I will propose an account of this phenomenon, based in part on Kagan and Pereltsvaig's (2011a, b) analysis of genitive complements of intensive reflexive predicates. We will see in some detail how the semantico-pragmatic properties of individual prefixes, discussed in the previous chapters, interact with the choice of case.

Finally, in the conclusion, the uniform picture provided within the scalar framework is briefly summarized. I relate to the ways in which the present investigation contributes to our understanding of the principles that underlie scalarity within the verbal domain and lay out some questions for future research.

1 Scalarity and verbal prefixation

1.1. Introduction

The notion of scales and degrees has been employed in the linguistic literature to capture semantico-pragmatic properties of a broad range of linguistic items, including gradable adjectives and adverbs, prepositions, degree modifiers and verbs. Degree semantics has proved quite efficient in capturing the truth conditions of sentences that contain certain types of expressions, such as gradable adjectives. In this sense, we can think of scales as a convenient tool that allows us to represent the semantics of various classes of linguistic expressions in a satisfactory way. But the usefulness of scales extends further than that. A consideration of linguistic phenomena from the scalar perspective brings to our attention novel aspects of these phenomena. New questions arise, comparisons along novel parameters are drawn, and, as a result, a deeper understanding of the semantic nature of the phenomena is obtained. These resulting insights in turn constitute strong evidence for the appropriateness of a scalar analysis of the individual phenomena.

The interpretation of gradable adjectives and of degree modifiers with which they combine has been investigated especially extensively within the framework of degree semantics. Linguistic items belonging to other categories have received somewhat less attention. But in recent years, increasing attention has been devoted to investigating the role of scale structure within the verbal domain. Here too, the application of the notion of scales has resulted in novel insights, giving rise both to new approaches to already familiar and well-documented phenomena and to new observations and generalizations. For instance, Filip (2008) provides a new approach to telicity that captures certain striking contrasts between Germanic and Slavic languages; Kennedy and Levin (2008) develop an analysis that captures the complex aspectual properties of degree achievements; Rappaport Hovav (2008, 2011, 2014) investigates a range of aspectually relevant lexical semantic properties of verbs and draws a comparison between property scales and path scales as lexicalized by verbal stems.

The goal of the present study is to contribute to the investigation of the semantics of verbal constituents within a scalar framework. I will approach

this intricate subject from the perspective of an equally intricate phenomenon – verbal prefixation in Russian. I will propose below that considering this phenomenon from a scalar perspective is quite advantageous for a number of reasons. First, such an approach makes it possible to gain a deeper understanding of the system that underlies the application of such prefixes. Using degree semantics, we can define the semantic core that unifies different prefixes and/or different uses of a given prefix, as well as those parameters that distinguish between individual prefixes and their uses. The scalar approach thus allows us to observe and formally capture numerous predictable patterns within this complex and diverse system. Second, given that we are dealing with verbal prefixes that interact, both structurally and semantically, with other elements within the verbal phrase, the investigation of their properties contributes significantly to the study of verbal scales and of the roles that scales can play in the semantics of verbs and VPs.

This chapter is organized as follows. Section 1.2 is devoted to ways in which scalar semantics has been applied to a number of linguistic phenomena. Subsection 1.2.1 briefly reviews a scalar approach to certain aspects of adjectival semantics, while Subsection 1.2.2 concentrates on the verbal domain. In Section 1.3, I turn to a discussion of Russian verbal prefixes. Subsection 1.3.1 introduces the phenomenon, the diversity with which it is associated and a range of questions that are raised in the course of its investigation. Subsection 1.3.2 contributes to the picture by describing the different approaches to the study of Slavic verbal prefixes that have been taken in the linguistic literature. The line of research to be taken in the present study is outlined against this background. In Subsection 1.3.3 I present the Scale Hypothesis, a scalar approach to the semantics of Russian verbal prefixes. This approach will be employed in the following chapters for investigating individual prefixes and those features that unify various prefixes and differentiate them. Further, the degree semantic perspective will prove helpful for extending the discussion of prefixation to the broader perspective of scalarity in the verbal domain. Finally, Section 1.4 addresses a number of issues that have received considerable attention in the literature on Slavic verbal prefixation, including certain classifications of prefixes that have been previously proposed. The section introduces concepts and distinctions that will be useful in the following discussions.

1.2. Scales in linguistics

1.2.1 The adjectival domain

1.2.2.1 Semantics of gradable adjectives

The notions of scales and degrees are particularly well associated with the semantics of adjectives (see Kennedy 1999 and references therein). Gradable

adjectives, such as *tall*, *clever*, *hot* or *expensive*, are taken to denote properties that hold of different individuals to different degrees. For instance, *clever* does not create a simple two-way dichotomy between individuals who possess cleverness (and belong to the set denoted by the adjective) and the ones who do not. Rather, different individuals are characterized by different degrees of cleverness; moreover, whether or not a given individual will be judged as clever largely depends on the context.

This suggests that such adjectives cannot be analyzed as common one-place predicates of type <e,t>, that is, functions from individuals to truth values. Instead, gradable adjectives are taken to have a degree argument, in addition to an individual-type argument, and to denote a certain relation between the individual and the degree. According to this approach, the adjective lexicalizes a certain scale and maps its individual-type argument to a certain degree on this scale. For example, in the sentence *John is 2 meters tall*, John is related to a particular degree of tallness. The individual John and the degree *two meters* constitute the two arguments of the adjective, which are related to one another in a particular way.

Let us turn to a more formal representation of the semantics of gradable adjectives. Formally, a scale constitutes a set of abstract representations of measurement, or degrees, that are totally ordered along some dimension (e.g. height, duration, temperature). Within degree semantics, somewhat different approaches to adjectival meaning can be found. The approaches seem to differ in formal details but not in terms of the underlying intuitions regarding the semantic contribution of gradable adjectives. For instance, one approach treats an adjective as a function from individuals to degrees. This approach is taken, for instance, in Kennedy (2001) and Kennedy and Levin (2002). (Kennedy and Levin further enrich adjectival semantics with a temporal argument, which is an issue we can ignore at this point.) An alternative analysis is taken by Heim (2000), who treats gradable adjectives as functions of type <d,<e,t>>. The adjective first combines with its inner degree argument, rendering as the output a property of type <e,t>, that is, a set of individuals who possess the property it lexicalizes to the degree *d*. Then the individual-type argument is added, and the output constitutes a truth value: T if the individual belongs to this set; and F if it does not. To illustrate, the compositional semantics of the sentence *John is 2 meters tall* is provided in (1):

(1)	John	<e>	j
	two meters	<d>	2 m[1]
	tall	<d,<e,t>>	λdλx.tall(d)(x)

[1] A simplified treatment of the expression *2 meters* is used in (1). Alternatively, this expression can be analyzed as a degree modifier (see, e.g., Kennedy and McNally 2004).

two meters tall	<e,t>	[λdλx.tall(d)(x)]
(2m) = λx.tall(2m)(x)		
John is two meters tall	<t>	tall(2m)(j)

In what follows, Heim's approach to adjectival semantics will be used. This choice is dictated by reasons of convenience.

Further, an important role in the semantics of gradable adjectives is assigned to the *standard of comparison*. In a sentence like *John is tall* (a sentence of the form *DP is AP*), the degree of John's tallness is not specified, but the adjective is still taken to link an individual to a degree. In particular, the sentence is understood to assert that the degree of John's tallness is not lower than the standard of comparison, contextually provided. Basically, John is entailed to be tall relative to the relevant comparison class (see Klein 1980, Kennedy and McNally 2005, Kennedy 2007 and references therein), a class of objects that are similar to John in relevant respects and constitute the comparison set in the respective context (e.g. American male adults). The semantics of the sentence *John is tall* is thus represented in (2):

(2) $\exists d\,[\text{tall}(d)(j) \wedge d \geq d_c)]$

d_c is the standard of comparison provided by the context. I further assume that the degree argument of the adjective gets bound by an existential quantifier by means of existential closure (Heim 1982).[2] According to (2), the sentence asserts that there is a degree *d* such that John is *d*-tall and *d* is at least as high as the standard of comparison.

Let us further consider the semantics of comparative adjectives, as it will play an important role once we turn to scales within the verbal domain. The semantics of (3), which contains an adjective in its comparative form, is provided in (3'). The semantics of (3) is thus quite similar to that of *John is tall*: in both cases, a comparison between two degrees is involved, but the truth conditions of (3) do not depend on the context. Here, the height of John is compared to that of Mary, rather than to a contextually specified standard.

(3) John is taller than Mary.

(3') $\exists d \exists\, d'\,[\text{tall}(d)(j) \wedge \text{tall}(d')(m) \wedge d > d']$

[2] Alternatively, the semantic of *John is tall* can be represented by the use of the maximality operator (Heim 2000), as in (i):

(i) $\max\{d: \text{tall}(d)(j)\} \geq d_c$

In this representation, it is explicitly specified that the maximal degree to which John is tall does not fall short of the standard. In what follows, I will use representations of the kind provided in (2). However, it will be implicitly assumed throughout this study that tall(d)(j) (John is *d*-tall) stands for: *d* is the maximal degree of John's tallness. In other words, for the sake of simplicity of the formulae, maximality will be assumed implicitly.

(3') asserts that John is tall to a degree *d*, Mary is tall to a degree *d'*, and *d* is higher than *d'*.

Such sentences as (4) below suggest that it is useful to have the means to relate to "differences in the degree to which different things (or the same things at different times) have some property" (Kennedy and Levin 2002:4). These are *differential degrees* (Kennedy 2001), or *difference values* (Kennedy and Levin 2002).

(4) John is 10 cm taller than Mary.

Using the notion of difference value and degree addition (Kennedy and Levin 2002), (3) and (4) can be translated as (3'') and (4'), respectively (where the subscript $_{DV}$ marks a variable over degrees that represents the difference value):

(3'') $\exists d \exists d' \exists d_{DV}$ [tall(d)(j) ∧ tall(d')(m) ∧ d ≥ d' + d_{DV}]

(4') $\exists d \exists d'$[tall(d)(j) ∧ tall(d')(m) ∧ d ≥ d' + d_{10}]

1.2.1.2 Types of scales

It should also be noted that scales lexicalized by adjectives (and, as we will see below, by items of other categories as well) may differ along several parameters. The first one, most obviously, is the dimension. Thus, the adjectives *cold*, *warm* and *hot* lexicalize temperature scales, whereas *tall* lexicalizes the scale of height. Another parameter is the ordering relation. Ordering is an essential property of a scale, but I assume that scales with the same dimensions may be characterized by reversed ordering relations. This happens with pairs of antonyms such as *tall – short* or *wide – narrow*. To illustrate, both *tall* and *short* lexicalize height scales; that is, they share the same dimension, but the two scales involve opposing ordering relations. The scale introduced by *short* can thus be viewed as a reversed version of the scale for *tall*. This way we can capture the fact that for any *a* and *b*, if *a* is taller than *b*, then *b* is shorter than *a*. In other words, if *a* receives a higher degree of tallness, then it has a lower degree of shortness.[3]

The third parameter, which will turn out to be important for our purposes, has to do with scale boundaries. A scale can be open on both sides, closed on both sides or open on one end and closed on the other. This distinction

[3] Alternatively, one can assume that pairs of antonyms such as *tall* and *short* lexicalize the same scale. This system will work if a distinction is introduced between *positive and negative degrees* (see Kennedy 2001 and references therein). As stated by Kennedy (2001), "positive degrees are intervals that range from the lower end of a scale to some point, and negative degrees are intervals that range from some point to the upper end of a scale" (p. 52). Nothing essential for the purposes of the present study hinges on the choice between these two systems.

has received considerable attention in recent literature on adjectival semantics (e.g. Rotstein and Winter 2004, Kennedy and McNally 2005, Kagan and Alexejenko 2010). The relevant question is whether there exists the minimal or the maximal degree to which the property can hold of an individual. For instance, the property lexicalized by the adjective *full* has both a minimal and a maximal degree. An entity (e.g. a glass) may be completely (= maximally) full, or it may be absolutely empty, in which case it is characterized by the minimum (zero) fullness. Thus, the scale lexicalized by this adjective (as well as the one lexicalized by its antonym *empty*) is closed on both sides (*a totally closed scale* in the terminology of Kennedy and McNally2005). In turn, the scale contributed by the adjective *clean* is closed only on one (upper) end. There is a maximal degree of cleanliness, which is mapped onto absolutely clean entities. But there is no minimal degree of cleanliness: no matter how dirty an entity is, it could presumably be even dirtier. Consequently, the reversed scale lexicalized by the adjective *dirty* is only closed on the lower end. We can talk about zero dirtiness (= absolute cleanliness) but not about maximal dirtiness, as suggested above. Finally, certain adjectives are assumed to contribute totally open scales, which lack minimal as well as maximal values and are open on both ends. This is the case, for instance, for the adjective *clever*. Presumably, there is no maximal degree of cleverness and no minimal degree of cleverness (which would also be the maximal degree of stupidity).

We can thus distinguish between four kinds of scales: totally open, totally closed, closed only at the top and closed only at the bottom. It appears, however, that for the purposes of the present investigation, only the distinction between scales that are closed on the upper end and the ones that are not will be relevant. In other words, the important question will be whether a scale has a maximal degree or not; the (non-)existence of a minimal degree will be generally irrelevant. Therefore, in what follows, I will use the term *closed scale* for those scales that have an upper boundary (*totally closed scales* and *upper closed scales* in Kennedy and McNally's terminology) and the term *open scale* for those scales that lack an upper boundary (*totally open scales* and *lower closed scales*).

1.2.2 The verbal domain

The linguistic relevance of scale structure has been further extended to the verbal domain (e.g. Hay *et al.* 1999, Kennedy and Levin 2002, 2008, Filip and Rothstein 2006, Filip 2008, Rappaport Hovav 2008, 2011, 2014, Piñón 2008, Caudal and Nicolas 2005, McNally 2011). Probably the most straightforward relation between the adjectival and verbal domains as far as scales are concerned is through degree achievement verbs, such as *cool*, *lengthen* and *darken*. Note that the verbs just mentioned are even morphologically derived

from gradable adjectives, although this is not obligatory for a degree achievement (e.g. the verb *grow* is not derived from an adjective). The verbs, similar to the corresponding adjectives, introduce certain scales, which are, in these cases, the scales of temperature, length and darkness. While the adjectives map individuals to degrees on these scales, the verbal semantics is more complex. In particular, the verbs denote a change that takes place along these scales, that is, a change in the degree to which an argument is characterized by the gradable property. More precisely, the argument is entailed to possess the property at the end of the event to a higher degree than at its beginning (Hay *et al.* 1999). Following Rothstein (2008) and certain aspects of the semantics provided by Kennedy and Levin (2002), the meaning of a sentence like (5) can be represented as in (5').

(5) The canyon widened.

(5') ∃e [WIDE(the-canyon)(END(e)) > WIDE(the-canyon)(BEG(e))]
where BEG is the function from events to times that returns an event's beginning point
END is the function from events to times that returns an event's final point
(based on Kennedy and Levin 2002)

(5') asserts the existence of an event at whose endpoint the degree of the canyon's width is higher than at its beginning point.

The representation in (5') differs somewhat from the approach to the semantics of gradable predicates assumed above. First, the adjective receives an additional temporal argument (Hay *et al.* 1999, Kennedy and Levin 2002), since it is important for the current purposes to distinguish between the degrees to which the same object is wide at different temporal intervals. Second, *wide* here is taken to be a function whose value is a degree (rather than truth value). Translating (5') to a Heim-like approach assumed in the previous subsection, we get the logical form in (5''). The truth conditions represented in (5') and (5'') are identical. Although (5'') looks somewhat more complex, this approach will be adopted in what follows, as it proves to be more convenient for representing the semantics of prefixes.

(5'') ∃e∃d∃ d′ [WIDE(d)(the-canyon)(END(e)) ∧ WIDE(d′)(the-canyon)(BEG(e)) ∧ d > d′][4]

[4] It is very important to emphasize that P(d)(x)(END(e)) is used here to mean that *d* is the maximal degree to which the property *P* characterizes *x* at the endpoint of *e*. The maximality component is not made explicit here for the sake of simplicity, but it is implicitly assumed in Kennedy and Levin (2002) and is similarly assumed throughout the present study.