

Verbs as Linguistic Markers of Social Agency - The Social Side of Grammar

Journal:	<i>European Journal of Social Psychology</i>
Manuscript ID	EJSP-15-0431.R1
Wiley - Manuscript type:	Research Article

SCHOLARONE™
Manuscripts

Peer Review

Verbs as Linguistic Markers of Agency - The Social Side of Grammar

Magdalena Formanowicz

University of Humanities and Social Sciences, Warsaw

University of Bern

Janin Roessel

University of Mannheim

Caterina Suitner and Anne Maass

University of Padova

Author Note

Magdalena Formanowicz, Department of Psychology, University of Bern, Switzerland; Janin Roessel, Department of Social Psychology, University of Mannheim, Germany; Anne Maass and Caterina Suitner, Department of Developmental and Socialization Psychology, University of Padova, Italy.

Correspondence concerning this article should be addressed to Magdalena Formanowicz, Department of Psychology, University of Bern, Fabrikstrasse 8, CH-3012 Bern, Switzerland. Tel +41 (0)31 631 54 32. Fax +41 (0)31 631 82 12
E-mail: magda.formanowicz@gmail.com

The authors declare that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

This research was supported by the grant WP/BST/IND/2012/B/8 awarded to the first author from the Polish Ministry of Science and Higher Education as core funding for statutory research for the SWPS University of Social Sciences and Humanities, Faculty of Psychology.

Abstract

Basic grammatical categories may carry social meaning irrespective of their semantic content. In a set of four studies, we demonstrate that verbs – a basic linguistic category present and distinguishable in most languages – are related to the perception of agency, a fundamental dimension in social perception. In an archival analysis on actual language use in Polish and German, we found that targets stereotypically associated with high agency (men and young people) are presented in the immediate neighborhood of a verb more often than non-agentic social targets (women and old people). Moreover, in three experiments using a pseudo-word paradigm, verbs (but not adjectives and nouns) were consistently associated with agency (but not communion). These results provide consistent evidence that verbs, as grammatical vehicles of action, are linguistic markers of agency. In demonstrating meta-semantic effects of language, these studies corroborate the view of language as a social tool and of language as an integral part of social perception.

Keywords: language, meta-semantic effects, verbs, agency, social judgment

Verbs as Linguistic Markers of Agency - The Social Side of Grammar

"Yes, we can!" is the most famous political slogan of our times, a slogan that propelled many people into action in favor of the prospective president Barack Obama. Interestingly, it is the slogan employing the verb (i.e., "can") that became the benchmark of Obama's campaign in 2008 and not those that were used in parallel like "Change" or "Forward". Similarly, the brand Apple is mainly associated with verb-based slogans such as "Think Different", "Get a Mac" or "Switch" than with slogans without a verb-focus such as "The Power to Be Your Best". Why? In this article we argue that verbs (vs. adjectives and nouns) are a linguistic category that conveys information above and beyond the specific semantic content and that these *meta-semantic effects* influence people's cognitive processes (for a similar notion regarding non-referential and para-semantic effects of language see Fiedler, 2008). Specifically, we claim that verbs imply dynamic properties that other grammatical categories (nouns and adjectives) lack and that make them the preferred syntactic device to convey activity. By extension, we propose that verbs also convey agency, a basic dimension in human perception that is related to goal achievement and stereotypically associated with specific target groups such as men or young people (for an overview see Abele & Wojciszke, 2014). Even if the link between grammatical categories and agency has – to our knowledge – never been directly examined before, the existing literature yields preliminary support to the notion of a verb-agency link.

Verbs: The Dynamic Grammatical Category

Up until now, the link between grammatical categories and social meaning was investigated primarily as regards the concreteness - abstractness dimension within the Linguistic Category Model (LCM, Semin & Fiedler, 1988) and its subsequent developments (Carnaghi, Maass, Gresta, Bianchi, Cadinu, & Arcuri, 2008). According to this theoretical

perspective, linguistic categories differ in terms of the abstractness of the information they convey. Regarding verbs, the LCM distinguishes descriptive action verbs (DAV), which are the most concrete and refer to behavior in a specific situation (e.g., “he kicked the dog”), interpretative action verbs (IAV), which describe a larger class of behaviors (e.g., “he hurt the dog”), and the third and smallest verb class, namely state verbs (SV), which describe psychological states (e.g., “he hates the dog”)¹. Adjectives (e.g., “he is an aggressive person”) and nouns (e.g., “he is an aggressor”) are more abstract than verbs and are mainly used to express general, dispositional judgments (Carnaghi et al., 2008; Gelman & Heyman, 1999; Walton & Banaji, 2004). Whereas nouns and adjectives represent relatively static, enduring qualities, verbs generally reveal dynamism. Moreover, the large majority of verbs (descriptive and interpretative action verbs) convey a sense of agency that is typically attributed to the subject of the sentence (Brown & Fish, 1983; Semin & Marsman, 1994). Thus, already within the LCM framework verbs are linked to activity and are seen to mostly denote actions and describe behaviors rather than dispositional traits, for which other grammatical categories become more distinctive.

On a more basic level, the idea that different word classes are linked to different meanings also receives support from neuro-psychological research showing that prototypical words of different word categories (such as verbs vs. nouns) recruit partially distinct neural networks (Caramazza & Hillis, 1991; for a comprehensive overview of brain correlates of grammatical categories see Vigliocco, Vinson, Druks, Barber, & Cappa, 2011). However, Vigliocco and colleagues (2011) noted that clear neural differences emerged particularly when studies used prototypical verbs (referring to activities) and prototypical nouns (referring to objects) - that is, when a confound between grammatical classes (verbs vs. nouns) and their prototypical meaning (action vs. object) was present. Yet, the observation that verbs prototypically coincide with activity is central to our argument here. Intriguingly, verbs also

seem to prompt muscle activity more than other word classes. For instance, participants' zygomatic major muscle was activated more strongly when they were exposed to the verb "to smile" than to the adjective "funny" (Foroni & Semin, 2009; for a similar pattern of embodied processing of action verbs see Willems, Hagoort, & Casasanto, 2010).

Taken together, verbs, a basic grammatical category present in almost all languages (Kroeger, 2005), are linguistic devices used to express actions and agency. The aim of the present set of studies was to verify whether the verb-agency relationship extends to the social realm by testing whether (a) verbs are the preferred word class when referring to agentic groups and (b) whether perceivers correctly infer the agency tied to verbs.

Agency: The Dynamic Dimension in Social Perception

The “big two”, agency/competence and communion/warmth, have been identified as the fundamental dimensions that guide social judgment of the self, other individuals, and social groups (Abele, Cuddy, Judd, & Yzerbyt, 2008; Fiske, Cuddy, Glick, & Xu, 2002; Ybarra, Chan, Park, Burnstein, Monin, & Stanik, 2008). By definition, communion reflects "social acceptance and connection", whereas agency allows for the "pursuit of goals, given available opportunities" (Abele, Cuddy, et al., 2008, p. 1063). Thus, agency (just like verbs) can be considered as the dynamic component of the big two, with its focus on enacting and striving.

The dynamic nature of agency is not only reflected in its content, but also in how the construct is structurally represented in the semantic net. Recent research suggests that communion forms a semantically dense concept (Bruckmüller & Abele, 2013; Fiske et al., 2002), with closely clustered items (e.g., warm, sociable, gentle), whereas agency is perceived as more varied, especially in its negative components (Bruckmüller & Abele, 2013; Kenworthy & Tausch, 2008). Similarly, other research has found that judgments of people’s agency are easily changed (Abele, Rupperecht, & Wojciszke, 2008) depending on contextual

information, whereas situational changes in communion are rare (Uchrowski, Abele, & Bruckmüller, 2013). At a larger scale, agentic components of stereotypes change more easily than communal components (Twenge, 1997). The above-mentioned research suggests, that agency not only semantically refers to activity, but it also represents a more dynamic construct and is more influenced by contextual cues, whereas communion is a more stable and static construct. We here further extend the definition of agency, by showing that not only the content, not only the semantic structure, but also the syntactic choices contribute to its expression.

Although all of the aforementioned lines of work suggest a link between the grammatical category of verbs and the social dimension of agency, this link has not been examined directly so far. In fact, the semantic connotations of agency (vs. communion) have mostly been examined in reference to adjectives (Abele & Wojciszke, 2007, 2014; Bruckmüller & Abele, 2013). We will argue here that agency is better reflected in verbs than in adjectives and nouns and that agency concerns "doing actions" more than "being active". Our core argument is that agency is reflected in verbs rather than in adjectives and nouns.

The Present Research

In this article, we address a novel aspect of linguistic categories by linking verbs to the basic dimension of agency. The general idea is that verbs are distinctly associated with agency and that this link is visible both in language production and in inferences drawn from language.

Not only the specific verb-agency link is novel, but also its meta-semantic nature. We propose that grammatical categories per se are able to convey social meaning. This broad claim calls for tailored research approaches. Until now, only real words have been used in studies examining the role of linguistic categories in social psychology. However, in this case the meaning conveyed by the words' semantics is inevitably involved in the processing of the

grammatical categories. This is to some degree even true when words share the same stem, but differ in grammatical category (e.g., to act, active, actor/activist; to play, playful, player). Even in this case, meaning may change from one grammatical category to another, creating a natural confound between the meaning conveyed by the grammatical form and by the semantic of the word. Moreover, there are large frequency differences with which these words are used (as reflected in linguistic corpora, an issue we will return to in the general discussion). To avoid potential confounds due to semantics and to approximate the idea of meta-semantic effects, we employed two complementary methods here: a) a corpora analysis that investigates word classes irrespective of their meaning in real language use and b) a pseudo words paradigm that excludes the involvement of any semantic content.

Accordingly, we tested the verb-agency link in two sets of studies. First, we wanted to demonstrate the relationship between verbs and agency in actual language use. We therefore decided to turn to existing corpora and test for co-occurrences of verbs with agentic and non-agentic social targets (Study 1). The idea of a verb-agency link for social groups irrespective of the verbs' meaning was tested in a series of archival corpora analyses conducted in Polish and German. Since prior research has shown that men are perceived as more agentic than women (e.g., Diekmann & Eagly, 2000; Eagly & Karau, 2002) and young people as more agentic than old people (e.g., Cuddy, Fiske, & Glick, 2008), we focused on these two pairs of targets. We hypothesized that social targets associated with agency (i.e., men and the young) would be more likely linked with verbs than non-agentic targets (i.e., women and the elderly).

Second, we focused on the interpretation of language employing a pseudo-word paradigm. We predicted that verbs (but not adjectives and nouns) are interpreted as signaling agency. That is, people ascribe more agency to verbs than adjectives and nouns even when the semantic content is held constant. This hypothesis was tested in three experiments

conducted in Polish using a pseudo-word paradigm. Pseudo-words with the same word stem and a suffix unequivocally assigning the word to the grammatical category of verbs (e.g., to lann), adjectives (e.g., lannitive), or nouns (e.g., lanniness) allowed us to investigate whether grammatical categories per se convey social meaning.

In all experiments (Study 2 to 4), participants evaluated the degree to which such pseudo-verbs, -adjectives, and -nouns transmit a sense of agency. In addition to the focal agency dimension, we also assessed inferences about communion, the second “big two” dimension, to demonstrate discriminant validity. Based on the proposed meta-semantic verb-activity link, we hypothesized that, in contrast to adjectives and nouns, verbs would be associated with agency, but not communion. In Study 3 and 4, we further assessed potential correlates of pseudo words already investigated in prior research on the big two and/or on language abstraction: namely, valence (Suitner & Maass, 2008) and abstractness (Semin & Fiedler, 1988). Given that we used pseudo words free of semantic content, we did not make predictions about inferences regarding valence or abstraction. Our main aim was to show that the verb-agency link will explain unique variance even when controlling for perceived abstractness and valence. Thus, whereas the first (corpora) study focuses on language production, the latter (experimental) studies investigate the interpretation of words belonging to different word classes and shall establish the distinctness of the verb-agency link.

Study 1

Are verbs actually *used* to express agency in spontaneous language production? To answer this question we investigated the verb-agency link in spontaneous language use with reference to stereotyped groups. We hypothesized that targets stereotypically characterized by high agency (men and young people) are more likely associated with verbs than groups characterized by low agency (women and old people).

General Method

The agency-target association should be strongest, when the target (and not the object) is mentioned as the agent in the sentence (Fausey & Boroditsky, 2010; Fausey, Long, Inamori, & Boroditsky, 2010). In exemplary studies (Fausey & Boroditsky, 2010; Fausey, et al., 2010), when the logical agents occurred in the role of the subject and were, thus, paired with the verb (i.e., “he broke the vase”), they were ascribed more responsibility and higher financial fines than when the same event was presented without the crucial agent-verb pairing (“the vase broke”). Following this logic, we investigated instances where the target of interest (stereotypically agentic vs. not) was more often linked with a verb.

Moreover, the target-verb order should enhance the agency-target association in subject-verb-object languages such as Polish and also possibly in languages without dominant word order such as German (Bettinsoli, Maass, Kashima, & Suitner, 2015). Therefore, we compared instances of verbs directly following agentic versus non-agentic targets. These sentence structures should be most common and most effective in (differentially) conveying agency, which allowed us to test our hypothesis while keeping the grammatical structure constant. In the corpora analyses, we assessed: (1) the overall occurrence of the target words (to assess base rates) and (2) the frequency of the target words representing high versus low agency immediately followed by a verb (e.g., a search command for “men [verb]” instances). To set restrictive criteria for the verbs, we excluded word forms of the most common auxiliary and linking words “to have” and “to be” (cf. LCM coding manual, Coenen, Hedeboom, & Semin, 2006) from the analyses (but the results remain robust when including them²). The study composition is summarized in Table 1.

---- please insert Table 1 about here ----

We recorded the number of occurrences of target-verb collocations in reference to the total number of target word occurrences for all search targets. For Polish, we used the Polish National Corpus (Pęzik, 2012; <http://www.nkjp.uni.lodz.pl>). This corpus comprises a

representative sample of language use, consisting of input from books (29%), press (50%), other written data (4%), internet (7%), and spoken language (10%). For German, we used the archive Tagged-C of the German Reference Corpus DeReKo (Kupietz, Belica, Keibel, & Witt, 2010), which comprises over 6.47 million texts of 26 German corpora with ca. 96% of the texts stemming from newspaper and press texts and another 3% stemming from the internet (for a list of all corpora, cf. <http://www.ids-mannheim.de/cosmas2/projekt/referenz/korpora.html>)³.

Results

The results shown in the upper section of Table 2 indicate that in Polish, the co-occurrence of the target group "men" followed by verbs is 1.38 more likely than the co-occurrence of "women" and verbs (Odds Ratio = 1.45, 95%CI = [1.41; 1.49]; $\phi = 0.06$). In German, this pattern is replicated, with "men" in collocation with verbs being 1.14 more likely than "women" in collocation with verbs (Odds Ratio = 1.17, 95%CI = [1.16; 1.18]; $\phi = 0.03$).

For age, in Polish, the co-occurrence of the target group "young people" and verbs is 2.89 more likely than that of "old people" and verbs (Odds Ratio = 3.27, 95%CI = [2.73; 3.92]; $\phi = 0.09$). In German, this pattern is replicated, with "young people" in collocation with verbs being 1.19 more likely than "old people" in collocation with verbs (Odds Ratio = 1.22, 95%CI = [1.19; 1.25]; $\phi = 0.03$).

---- please insert Table 2 about here ----

Discussion

The corpora analyses attest to a verb-agency link in real language use: Stereotypically agentic targets (i.e., men and young people) were more likely followed by verbs than non-agentic targets (i.e., women and old people). This study provides consistent evidence for a natural link between target agency and verbs in language production across a variety of

domains – and irrespective of the verbs’ meaning. Whether the producers of these innumerable instances of language chose their expressions strategically to depict agentic targets as agents and as being active, or whether they did so unintentionally, remains elusive at this point. For communicative functions, however, audiences must be able to detect the agency hidden in verbs (vs. adjectives and nouns). Are recipients able to interpret verbs in line with the (presumed) communicative intentions of the communicator? To investigate this question we conducted three experimental studies.

Experimental Pseudo-Words Paradigm

Studies 2 to 4 were designed to test whether verbs are ascribed more agency than other linguistic categories. In order to examine how grammatical categories per se are related to social meaning, we aimed at “switching off” the semantic content. To do so, we relied on pseudo-words tailored to the Polish language. We relied on Polish for these experiments, because it is possible to indicate the grammatical gender unequivocally solely based on the word’s suffix in this language. Manipulating grammatical gender would have been more complex in English and German for instance (e.g., due to the necessity to add the indefinite marker “to” in English for a verb, such as in “to marn” or deal with capital letters and more ambiguous endings in German).

We hypothesized that pseudo-verbs would convey more agency than pseudo-adjectives and pseudo-nouns. This effect of grammatical categories should be specific for the dimension of agency and it should not hold for communion judgments.

General Method⁴

In all three experiments, participants evaluated a list of pseudo words that comprised the same number of pseudo-verbs, adjectives, and nouns (five in Study 2 and three in Studies 3 and 4, respectively). Pseudo-word sets were selected based on careful pretesting that assured pronounceableness and meaninglessness across the three linguistic categories. To

create the pseudo-word stems, a formula in Excel randomly generated phonemes to construe two-syllable word stems consisting of two C-V-C syllables, where C means consonant and V means vowel. This syllable configuration is among the most frequent in Polish (Śledziński, 2010). The 360 created word stems were screened to fulfill the following criteria: (1) possible pronunciation and orthography, (2) meaninglessness, (3) comprising biphonemes and triphonemes in Polish language (Śledziński, 2010). In the next step, suffixes were added indicating either the infinitive of the verb (-ić, -ować, -yczyć), the nominative of the adjective (-ne, -kie etc.), or the suffix for nouns conveying a sense of abstractness (-stwo being typical for words like manhood – Study 2 and 3) or suffixes of common nouns (Study 4). These variants were again screened to assure ease of pronunciation, orthographic compatibility, and absence of meaning.

The final list of 36 pseudo-word sets was pretested among a group of 26 native Polish speakers. Participants were randomly assigned to three groups differing in the order of presented stimuli (starting either with verb, adjective, or noun with word stems in a same fixed random order). Participants were presented with each of the 36 word stems only once – either in the form of a verb, adjective, or noun (i.e., each participant viewed twelve verbs, adjectives, and nouns in total). Participants indicated whether they perceived the presented words as nonsensical (1 = *does not at all remind of an existing word* to 6 = *reminds very much of an existing word*). Based on these results, fifteen pseudo-word sets were selected so that: (a) they were rated similarly in their nonsensicality across the three linguistic categories ($ps > .05$) and (b) they were significantly different from the midpoint of the scale (3.5, $ps < .05$) in the direction of nonsensicality. The stimuli used in Studies 2 and 3 are presented in the upper part and for Study 4, with partially changed suffixes, in the lower part of Table 3.

---- please insert Table 3 about here ----

All studies had a within-subject design with participants evaluating all types of grammatical categories. To control for the within-participant variance in the judgments of grammatical categories, we analyzed the data using a multilevel framework, with words nested within participants. Analyses were conducted with Mplus 7 (Muthén & Muthén, 1998–2012) and the Maximum Likelihood Robust estimator was used in all analyses.

Study 2

Method

Participants. Sixty students of mathematics of Warsaw University participated (31 women, $M_{Age} = 22.23$ years, $SD_{Age} = 6.24$ years).

Procedure. For the paper-pencil task, we used the 15 pseudo-word sets obtained from the pretest. Pseudo-words were presented in a fixed random order and participants evaluated lists consisting of 15 stimuli (5 verbs, 5 adjectives, 5 nouns). Three lists were created, each starting with the same word stem but a different suffix (i.e., a different grammatical category). The instruction read as follows: "This 5 minute study investigates how meaning is construed in language based on artificial grammar. Please evaluate the following 15 artificial words. As the words are nonexistent, please rely on your intuition. Please try not to think for too long, rather rely on your first impression." Before participants rated the words, they were asked to classify them according to their grammatical category (adjectives, nouns, verbs, other). Overall, 91.56% of the classifications were correct, which is similar to the number of correct classification in the LCM (Semin & Fiedler, 1988). Finally, participants were instructed to perform a forced choice selecting which of the two content domains, agency or communion, each word matched (with descriptions adapted from Abele & Wojciszke, 2007; Abele, Uchrowski, Suitner, & Wojciszke, 2008):

A - Agency was introduced as an "orientation toward actions and being efficient. It is about striving to achieve goals." As examples, real words denoting agency were provided,

including two nouns (activity, success), two adjectives (ambitious, diligent), and two verbs (strive, achieve)⁵.

C - Communion was introduced as an "orientation toward others and focusing on relations with other people." As examples, real words denoting communion were provided, including two nouns (friendship, politeness), two adjectives (warm, tolerant) and two verbs (help, support).

The order of the agency and communion descriptions was counterbalanced. The pseudo-words were presented in a booklet, with each word presented separately on a piece of paper. Beside each word, there were two letters A or C standing for agency and communion respectively. The order of the letters matched the order of the instructions.

Results and Discussion

To determine if grammatical category predicted whether participants perceived the word either as agentic (value 1) or communal (value 0), analyses were run with the grammatical category as a within-participants predictor. Random intercepts were estimated. Two orthogonal contrasts were created. In the first one, verbs (coded as 2) were compared to the two other categories (both coded as -1). In the second contrast, adjectives (1) were compared to nouns (-1). The means for all three experiments are presented in Table 4. A saturated model was estimated in which the two contrasts were used to predict the agency-communion ratings at the within participants level; at the between level, only the random intercept was estimated. The results of this model are shown in the Table 5. As predicted, the log odds of choosing agency over communion were higher for verbs versus the other categories ($B = 0.16$; $SE = 0.06$; $p < .01$; Odds Ratio = 1.17). There was no difference between adjectives and nouns in the ascription of agency versus communion ($B = -0.05$; $SE = 0.09$; $p = .59$; Odds Ratio = 0.95).⁶

---- please insert Table 4 and 5 about here ----

This pattern lends first support to our claim that verbs uniquely carry agency information, which is extracted by perceivers. However, this study has a number of limitations. First of all, participants had to make forced-choice decisions regarding agency-communion. This dependent variable does not take into consideration that agency and communion are in fact two dimensions and that a word may be perceived as agentic and communal at the same time. This issue was addressed in the subsequent studies. Furthermore, prior to judgments of agency and communion, participants had to classify words according to their grammatical category (adjectives, nouns, verbs, other) and this task could have primed them into looking for an overlap between the grammatical classification and the consecutive rating task. As this might have biased the results, the classification task was presented after the evaluation of the words in the following studies.

Study 3

In Study 3, we assessed agency and communion as separate dimensions to substantiate the present findings.

Method

Participants. One hundred and four students participated in the study (13 men, 58 women, 33 people did not provide information on their gender; $M_{Age} = 21.03$ years, $SD_{Age} = 0.83$ years).

Procedure. Given that participants had to rate the words on several dimensions, we reduced the pseudo-word sets to nine word stems. Pseudo-words were selected from the pretest with the same criteria as in Study 2 and set in a fixed random order. Participants evaluated paper-pencil lists consisting of nine stimuli (3 verbs, 3 adjectives, 3 nouns). Three lists were created, each starting with the same word stem but with a different suffix, and the instruction resembled that provided in Study 2. This time, agency and communion were assessed using two Likert scales rather than a forced-choice format ($-5 = opposite of$

agency/communion to 5 = *perfect example of agency/communion*, cf. Abele & Wojciszke, 2007). As in Study 2, examples of agency and communion were provided. Moreover, participants evaluated the valence and the concreteness-abstractness of words on two scales (-5 = *negative/concrete* to 5 = *positive/abstract*). The instruction regarding the latter dimension read as follows: "Concrete words denote things that exist in reality and it is easy to picture them; abstract words rather reflect thoughts and ideas and do not have physical representations." Examples of concrete words were "shoe," "green," and "to kick," and of abstract words "friendship," "spiritual," and "to contemplate." (cf. Brysbaert, Warriner, Kuperman, 2014, for a similar operationalization). Participants received the words in a booklet. Each word was presented at the top of a page followed by the evaluation of the four dimensions in the order: agency and communion (counterbalanced), abstractness, and valence. Finally, participants reported, for each pseudo-word, the extent to which it reminded them of the real grammatical category (e.g., verbs for pseudo verbs etc.) on a scale -5 *not at all* to 5 *very much*. All three grammatical categories were recognized correctly (verbs: $M = 2.90$, $SD = 2.43$; adjectives: $M = 1.72$, $SD = 2.50$; and nouns: $M = 2.03$, $SD = 2.47$), as indicated by a significant difference from 0, representing the midpoint of the scale (all $ps < .001$)⁷.

Results and Discussion

Two orthogonal contrasts were created. In the first one, verbs (coded as 2) were compared to the other two categories (both coded as -1). In the second contrast, adjectives (1) were compared to nouns (-1). The conceptual model that was tested is presented on Figure 1.

---- please insert Figure 1 about here ----

At first, we evaluated a saturated model. Second, we defined additional constraints to test the hypothesis of a unique verb-agency link. The constraints were as follows: (a) We set the path from Contrast 2 (comparing adjectives and nouns) to the evaluation of agency to zero as we

have not hypothesized any difference between these two categories; (b), we set the coefficients for both contrasts to 0 in reference to communion judgments as we have not hypothesized any relevance of the grammatical categories to the communion dimension.⁸

The results of the saturated and the constrained models are shown in Table 6. The obtained results are congruent with the hypothesized relationships. Verbs led to higher agency perceptions than nouns and adjectives. Moreover, grammatical categories were unrelated to the communion judgments. Taken together, these analyses replicate the results of Study 2. Extending these findings, it is evident that perceived abstractness of words was negatively related to the judgment of agency, meaning that the more abstract the word was perceived, the less it was perceived as agentic.

However, it is noteworthy that the nouns used as stimuli in this study were biased toward abstractness due to their suffix (reserved for abstract words). To correct for this fact and to test the robustness of our findings, in Study 4, we used suffixes common to broader classes of nouns (i.e., nouns in general with a feminine vs. masculine vs. neutral grammatical gender).

---- please insert Table 6 about here ----

Study 4

This study was a replication of Study 3 conducted to substantiate the findings obtained in the previous experiments. Moreover, new stimuli were used for the grammatical comparison group of nouns and we also varied also the grammatical gender of the adjectives.

Method

Participants. One hundred and twenty three students participated (58 men, 65 women, $M_{Age} = 20.41$ years, $SD_{Age} = 2.44$ years).

Procedure. There were two differences between Study 3 and 4 regarding the experimental procedure. The first difference was the earlier described change in the stimuli

(suffixes for common nouns instead of abstract nouns). The second difference was that participants classified words in terms of their grammatical class as in Study 2 (decision between grammatical categories instead of continuous ratings) but at the end of the experiment (as in Study 3) – 83.92% of the words were classified correctly.

Results and Discussion

Two orthogonal contrasts were created. In the first one, verbs (coded as 2) were compared to the two other categories (both coded as -1). In the second contrast, adjectives (1) were compared to nouns (-1). The conceptual model that was tested is presented in Figure 1 (i.e., it is the same as in Study 3). At first, we evaluated the saturated model. Second, we defined additional constraints in the model to test the hypothesis of a unique verb-agency link. The constraints were as follows: (a) We set the path from Contrast 2 (comparing adjectives and nouns) to the evaluation of agency to zero as we have not hypothesized any difference between the two categories; (b) we set the coefficients for both contrasts to 0 in reference to communion judgments as we have not hypothesized any relevance of the grammatical categories to the communion dimension. The results of the saturated and the constrained models are shown in the Table 6. Again, the obtained results are congruent with the hypothesized relationships. Verbs led to higher agency ascriptions than nouns and adjectives. Moreover, grammatical categories were unrelated to the communion judgments⁹. The correlation between abstractness and agency found in Study 3 was not evident now that the suffix of nouns was no longer confounded with abstractness.

General Discussion

To our knowledge, this is the first set of studies to show that social judgments are related to meta-semantic characteristics of language. Specifically, the present studies provide the primary empirical evidence that verbs (but not adjectives or nouns) are associated with agency. This verb-agency link is corroborated with evidence from (a) natural language use

and (b) the interpretation of language in controlled experiments. In actual language use as investigated with large-scale corpora analyses, stereotypically agentic social targets were more likely paired with verbs than non-agentic social targets (Study 1). Importantly, this pattern emerged for two languages belonging to different language families, Polish being a Slavic and German a Germanic language. Moreover, agency was specifically conveyed by verbs in the experiments with pseudo-words (Studies 2 to 4) and this effect was stable even when controlling for valence and perceived abstraction. The absence of systematic grammatical category effects on communion, generally considered the second fundamental dimension of social judgment, further attests to the specificity of the verb-agency link. Taken together, this evidence suggests a strong link between agency and the grammatical category of verbs, both in language production and in the construction of meaning from language.

From a methodological viewpoint, we would like to highlight that the findings from the corpora analyses (maximizing ecological validity) and from the pseudo-word studies (maximizing experimental control) converge. In particular, the pseudo-word paradigm employed in the three experimental studies has the great advantage that word class and meaning are not confounded, a problem that limits the validity of many studies on neural correlates of word classes (see Vigliocco et al., 2011, for an overview), as well as most LCM studies.

The verb-agency link fills another blank in the language-cognition puzzle and may inform future basic research on the meta-semantic properties of grammatical categories. Specifically, the relationship of the concreteness of verbs (as implied by the LCM) and their association to agency should be investigated to consolidate the present approach with the LCM in a more concise way. Importantly, the rationale and results of our studies are complementary to the LCM account. Our own approach, distinguishing verbs from other grammatical categories, overlaps only partially with the more fine-grained LCM model.

Within the LCM framework, state verbs seem to be a possible exception to the verb-agency link proposed here. Such verbs mostly refer to subjects' emotional (and potentially enduring) states rather than to actions and agency (Brown & Fish, 1983; Semin, 2000). Hence, they differ from other verb types mainly on semantic grounds, which go beyond the scope of the present research with its focus on meta-semantic effects. Compared to more common verb types, state verbs only constitute a small proportion of verbs and, possibly for this reason, Vigliocco et al. (2011) claim that prototypical verbs refer to actions. Based on learning theories it is reasonable to assume that such prototypical, well-learned associations drive meta-semantic effects. We used this notion in the pseudo-word studies and assumed that, when encountering pseudo-verbs, participants would refer to the central representatives of this grammatical category. This notion is supported empirically in our studies, where participants exposed to pseudo-words attributed more agency to verbs than to the other grammatical categories. Thus, they most likely relied on prototypical associations, while ignoring atypical instances such as state verbs. However, the interplay between grammatical categories, agency and concreteness vs. abstractness should be investigated systematically in the future.

Furthermore, potential lies in investigating the generalizability of the verb-agency link in other realms. The likelihood of verbs to evoke agentic associations may be mainly relevant in the social domain regarding the perception of individuals and groups, because it is precisely the context of social judgment where agency has proven to be an important coordinate in previous research. Within social judgment, people described by verbs (or describing themselves in this way) might be perceived as more agentic than those addressed with adjectives or nouns. These implications should be tested in future studies.

Outside the social judgment domain, agency may be less relevant. For instance, when inferring the importance of an attitude to one’s identity, grammatical categories may play a role primarily on the basis of their temporal qualities. In fact, in a set of studies on behavioral effects, people were found to be more affected by nouns than by verbs when their membership in socially desirable categories was at stake (Bryan, Adams, & Monin, 2012; Bryan, Walton, Rogers, & Dweck, 2011): People registered as voters were more likely to vote when questions probing their attitude in that matter were formed in a noun form “How important is it to you to be a voter in the upcoming election?” rather than a verb form “How important is it to you to vote in the upcoming election?” (Bryan et al., 2011, p. 12653). Similarly, those reminded not to be cheaters were less likely to cheat than those who were asked not to cheat (Bryan et al., 2012). Nonetheless, it may still be true that the description “Person X voted” is perceived as more agentic than the description “Person X was a voter” (i.e., a matter of social judgment). However, the comparison of nouns and verbs having the same word stem may be problematic in this case given that the noun is an agent noun formed from the verb and denotes a person doing this action (e.g., the word “*eater*” is derived from the verb “to *eat*”). In the case of “agent nouns”, one could hypothesize that the agency transfers from the verb to the noun (cf. also Vigliocco et al., 2011). Moreover, such nouns appear to be much less frequent than the respective verbs. In Table 7, we present the corpora frequencies of a sample of agent nouns and accompanying verbs that were used in previous studies (Bryan et al., 2012; Bryan et al., 2011) that attest to this possibility (upper section of Table 7). As a contrast, we also present a random sample of verbs and nouns from the comprehensive list of English lemmas (Brysbaert, Warriner, & Kuperman, 2014) in which a word can be used either as a verb (“to comb”) or a noun (“a comb”) in the lower section of Table 7. In case of the former set, nouns consistently evidenced lower frequencies than the associated verbs, which was not true for the random sample in the second set. This highlights

the uniqueness of “agent nouns” - Encountering them may make people think that they are used for a reason: for instance, to highlight the stability of the involved activity (which would likely trigger more attributions of agency). Naturally, people try to make sense of their world and pay close attention to inconsistencies. Moreover, frequency is known to influence the fluency of information processing and its consequences (e.g., Oppenheimer & Frank, 2008). Therefore, we consider the frequency issue a possible confound in making inferences about grammatical categories of real words that may also help reconcile the present findings with previous work.

On the background of these considerations, we had opted for artificial words for which the concerns about differences of frequencies of usage or semantics are not relevant (Studies 2 to 4) – next to the “all verbs” approach in the corpora analyses (Study 1). While we recognize that semantics and salience will guide the social perceiver, we would like to add that meta-semantic effects, such as the verb-agency link, may contribute to the sense-making process in a very subtle way, with the specific venues still to be investigated – a journey we are looking forward to take.

---- please insert Table 7 about here ----

Conclusion

Verbs express action. This functional property emerges as the first mentioned feature in many definitions of this class of words. For example, according to the Collins English Dictionary, a verb is “any of a large class of words in a language that serve to indicate the occurrence or performance of an action [...]”. According to Random House Kernerman Webster’s College Dictionary, verb is defined as “a member of a class of words that function as the main elements of predicates, typically express action [...]”. We here show that this property goes beyond grammar, intruding in cognition, and by extension in social cognition.

The well-established relation between language use and cognition (Semin, 1998) foresees that the linguistic properties shape and constrain the cognitive processing of the information conveyed by the linguistic devices we use and this has important implications in the social realm (Holtgraves & Kashima, 2008). For example, previous studies showed that choosing the first person pronoun moves our attention to the self (Chung & Pennebaker, 2007), or that dropping the pronoun moves the attention away from the target performing the action (Kashima & Kashima, 1998). Interestingly, in many cases the relation between language and cognition is saturated and explained by the semantic properties of the linguistic devices under scrutiny. In the previous example, the first person pronoun (I, me) semantically expresses the concept of self, and this conceptual priming by the words' semantics/meaning is critical for the effect. The LCM (and its extensions) offers a different perspective that categorizes language also according to structural properties (at least in the main difference between adjectives and verbs). However, the concrete implementation of the studies never fully disentangled the semantic and the structural aspects. For example, being an athlete versus being athletic (Carnaghi et al., 2008, Study 1) is grammatically different (noun vs. adjective), but it is also semantically different. Therefore, previous studies typically confirm that specific language devices (e.g., nouns) are used to express specific types of information (e.g., enduring characteristics), but it was unclear whether this use reflects the meaning of the word or the very nature of the language device per se, such that choosing a specific linguistic device conveys the corresponding information even in a context in which previous knowledge cannot contribute to meaning construction. The pseudo-word paradigm was designed to test the pure contribution of the grammar class, without any further influence embedded in previous knowledge, related to the semantics of the words or to the familiarity due to use-frequency. Although the present studies had the main goal to show that the grammatical class of verbs is cognitively associated to agency, they also inform about a

1
2
3 general meta-semantic effect of grammar. We eventually own literacy about the meaning of
4
5 word classes that is independent from the specific semantic content of the single words.
6
7 Moreover, we use this literacy both in natural production (Study 1) and during information
8
9 processing when no other information is present (Study 2, 3, 4). Therefore, meaning is not
10
11 solely conveyed by semantics, but syntax has a critical role as well. Importantly, the meta-
12
13 semantic feature of grammar extends to the social level: We appear to subtly discriminate
14
15 social targets and we enforce the social stereotype describing them through the consistent use
16
17 of grammatical classes by associating stereotypically agentic social groups to the
18
19 grammatical class that better expresses agency, namely verbs.
20
21

22
23 In sum, the present studies offer consistent evidence that basic grammatical categories
24
25 influence social perceptions and that people use these grammatical categories as a tool for
26
27 their expressions. The power of language stems from its pervasiveness and subtlety, which
28
29 make it difficult to control, both in usage and perception. Investigating the verb-agency link
30
31 within the language and social judgment domain may have important implications for
32
33 communication in the social, legal, or political domain. Returning to our opening example,
34
35 our results suggest that President Obama was right in adopting the slogan “yes, we can”
36
37 rather than opting for an adjectival or nominal equivalent. By the same logic, one may
38
39 suspect and observe that the recently founded Spanish party *Podemos* (span. “we can”) will
40
41 be more successful than the equivalent Italian movement called *Possibile* (ital. “possible”).
42
43 Our results suggest that Obama’s verb slogan and the party label *Podemos* convey the agency
44
45 required to introduce the proposed change.
46
47
48
49
50
51
52
53
54
55
56
57
58
59
60

References

Abele, A. E., Cuddy, A. J. C., Judd, C. M., & Yzerbyt, V. Y. (2008). Fundamental dimensions of social judgment. *European Journal of Social Psychology*, 38, 1063–1065. doi:10.1002/ejsp.57

Abele, A. E., Rupperecht, T., & Wojciszke, B. (2008). The influence of success and failure experiences on agency. *European Journal of Social Psychology*, 38, 436–448. doi:10.1002/ejsp.454

Abele, A. E., Uchonski, M., Suitner, C., & Wojciszke, B. (2008). Towards an operationalization of the fundamental dimensions of agency and communion: Trait content ratings in five countries considering valence and frequency of word occurrence. *European Journal of Social Psychology*, 38, 1202–1217. doi:10.1002/ejsp.57

Abele, A. E., & Wojciszke, B. (2007). Agency and communion from the perspective of self versus others. *Journal of Personality and Social Psychology*, 93, 751–63. doi:10.1037/0022-3514.93.5.75

Bettinsoli, M. L., Maass, A., Kashima, Y., & Suitner, C. (2015). Word-order and causal inference: The temporal attribution bias. *Journal of Experimental Social Psychology*, 60, 144–149. doi:10.1016/j.jesp.2015.05.011

Brown, R., & Fish, D. (1983). The psychological causality implicit in language. *Cognition*, 14, 237–273. doi:10.1016/0010-0277(83)90006-9

Brysbaert, M., Warriner, A. B., & Kuperman, V. (2014). Concreteness ratings for 40 thousand generally known English word lemmas. *Behavior Research Methods*, 46, 904–911. doi:10.3758/s13428-013-0403-5

- Bruckmüller, S., & Abele, A. E. (2013). The density of the big two: How are agency and communion structurally represented? *Social Psychology, 44*, 63–74.
doi:10.1027/1864-9335/a000145
- Bryan, C. J., Adams, G. S., & Monin, B. (2012). When cheating would make you a cheater: Implicating the self prevents unethical behavior. *Journal of Experimental Psychology: General*. Advance online publication. doi:10.1037/a0030655
- Bryan, C. J., Walton, G. M., Rogers, T., & Dweck, C. S. (2011). Motivating voter turnout by invoking the self. *Proceedings of the National Academy of Sciences of the United States of America, 108*, 12653–12656. doi:10.1073/pnas.1103343108
- Caramazza, A., & Hillis, A. E. (1991). Lexical organization of nouns and verbs in the brain. *Nature, 349*, 788–790. doi:10.1038/349788a0
- Carnaghi, A., Maass, A., Gresta, S., Bianchi, M., Cadinu, M., & Arcuri, L. (2008). Nomina sunt omina: On the inductive potential of nouns and adjectives in person perception. *Journal of Personality and Social Psychology, 94*, 839–59. doi:10.1037/0022-3514.94.5.83
- Chung, C., & Pennebaker, J. W. (2007). The psychological functions of function words. In K. Fiedler (Ed.), *Social Communication* (pp. 343–359). New York, NY: Psychology Press.
- Coenen, L., Hedeboew, L., & Semin, G. R. (2006). *Measuring abstraction: The linguistic category model*. Retrieved from <http://cratylus.org/resources/linguistic-model>
- Cuddy, A. J. C., Fiske, S. T., & Glick, P. (2008). Warmth and competence as universal dimensions of social perception: The stereotype content model and the BIAS map. *Advances in Experimental Social Psychology, 40*, 61–149. doi:10.1016/S0065-2601(07)00002-0

Diekman, A. B., & Eagly, A. H. (2000). Stereotypes as dynamic constructs: Women and men of the past, present, and future. *Personality and Social Psychology Bulletin*, 26, 1171–1188. doi: 10.1177/0146167200262001

Eagly, A. H., & Karau, S. J. (2002). Role congruity theory of prejudice toward female leaders. *Psychological Review*, 109, 573–598. doi:10.1037//0033-295X.109.3.57

Fausey, C. M., Long, B. L., Inamori, A., & Boroditsky, L. (2010). Constructing agency: The role of language. *Frontiers in Psychology*, 1(162), 1–11. doi:10.3389/fpsyg.2010.0016

Fausey, C. M., & Boroditsky, L. (2010). Subtle linguistic cues influence perceived blame and financial liability. *Psychonomic Bulletin & Review*, 17, 644–650. doi:10.3758/PBR.17.5.644

Fiedler, K. (2008). Language: A toolbox for sharing and influencing social reality. *Perspectives on Psychological Science*, 3, 38–47. doi: 10.1111/j.1745-6916.2008.00060.x

Fiske, S. T., Cuddy, A. J., Glick, P., & Xu, J. (2002). A model of (often mixed) stereotype content: Competence and warmth respectively follow from perceived status and competition. *Journal of Personality and Social Psychology*, 82, 878–902. doi:10.1037//0022-3514.82.6.87

Foroni, F., & Semin, G. R. (2009). Language that puts you in touch with your bodily feelings: The multimodal responsiveness of affective expressions. *Psychological Science*, 20, 974–80. doi:10.1111/j.1467-9280.2009.02400.

Gelman, A., & Heyman, D. (1999). Carrot-Eaters and creature-believers: The effects of lexicalization on children's inferences about social categories. *Psychological Science*, 10, 489–493. doi:10.1111/1467-9280.0019

- Kashima, E. S., & Kashima, Y. (1998). Culture and language: The case of cultural dimensions and personal pronoun use. *Journal of Cross-Cultural Psychology*, 29, 461–486. doi:10.1177/0022022198293005
- Kenworthy, J. B., & Tausch, N. (2008). Expectations about the accuracy and stability of warmth versus competence traits: An intergroup analysis. *European Journal of Social Psychology*, 38, 1121–1129. doi: 10.1002/ejsp.543
- Kroeger, P. (2005). *Analyzing grammar: an introduction*. Cambridge: Cambridge University Press.
- Kupietz, M., Belica, C., Keibel, H., & Witt, A. (2010). The German Reference Corpus DeReKo: A primordial sample for linguistic research. In: Calzolari, Nicoletta et al. (Eds.): *Proceedings of the seventh conference on International Language Resources and Evaluation* (LREC 2010, pp. 1848–1854). Retrieved from: http://www.lrec-conf.org/proceedings/lrec2010/pdf/414_Paper.pdf
- Muthén, L. & Muthén, B. (1998-2012). *Mplus User's Guide*. Los Angeles, CA: Muthén & Muthén. Available from <http://www.statmodel.com>.
- Oppenheimer, D. M., & Frank, M. C. (2008). A rose in any other font would not smell as sweet: Effects of perceptual fluency on categorization. *Cognition*, 106, 1178-94. doi:10.1016/j.cognition.2007.05.010
- Pęzik, P. (2012). *Wyszukiwarka PELCRA dla danych NKJP. Narodowy Korpus Języka Polskiego* [PELCRA Search Engine for Polish National Corpus]. (Przepiórkowski A., Bańko M., Górski R., Lewandowska-Tomaszczyk B. (red.). Wydawnictwo PWN.
- Semin, G. R. (1998). Cognition, language, and communication. *Social and cognitive approaches to interpersonal communication*, 229-257.
- Semin, G. R. (2000) Language as a Cognitive and Behavioral Structuring

Resource: Question—Answer Exchanges. *European Review of Social Psychology*, 11:1, 75-104, DOI: 10.1080/14792772043000004

Semin, G. R., & Fiedler, K. (1988). The cognitive functions of linguistic categories in describing persons: Social cognition and language. *Journal of Personality and Social Psychology*, 54, 558–568. doi:10.1037/0022-3514.54.4.55

Semin, G. R., & Fiedler, K. (1991). The linguistic category model, its bases, applications and range. In W. Stroebe & M. Hewstone (Eds.), *European review of social psychology* (Vol. 2, pp. 1–30). New York: Wiley.

Semin, G. R., & Marsman, J. G. (1994). Multiple inference-inviting properties" of interpersonal verbs: Event instigation, dispositional inference, and implicit causality. *Journal of Personality and Social Psychology*, 67, 836–849. doi: 10.1037/0022-3514.67.5.836

Śledziński, D. (2010). Fonemy, difony, trifony i sylaby – charakterystyka jednostek na podstawie korpusu tekstowego [Phonemes, diphones, triphones and syllables - unit charactersitics based on textual corpora]. *Kwartalnik Językoznawczy*, 2010, 3–4.

Suitner, C., & Maass, A. (2008). The role of valence in the perception of agency and communion. *European Journal of Social Psychology*, 38, 1073–1082. doi:10.1002/ejsp.52

Twenge, J. M. (1997). Changes in masculine and feminine traits over time: A meta-analysis. *Sex Roles*, 36, 305–325. doi:10.1007/BF02766650

Uchrowski, M., Abele, A.E., & Bruckmüller, S. (2013). Empathetic perspective taking and the situational malleability of the communal self-concept: How perspective-taking affects self-descriptions. *Self and Identity*, 12, 236–256.

- Verbs. (n.d.) *Collins English Dictionary – Complete and Unabridged*. (1991, 1994, 1998, 2000, 2003). Retrieved September 03 2015 from <http://www.thefreedictionary.com/Verbs>
- Verbs. (n.d.) *Random House Kernerman Webster's College Dictionary*. (2010). Retrieved September 03 2015 from <http://www.thefreedictionary.com/Verbs>
- Vigliocco, G., Vinson, D. P., Druks, J., Barber, H., & Cappa, S. F. (2011). Nouns and verbs in the brain: A review of behavioural, electrophysiological, neuropsychological and imaging studies. *Neuroscience and Biobehavioral Reviews*, 35, 407–26. doi:10.1016/j.neubiorev.2010.04.00
- Walton, G. M., & Banaji, M. R. (2004). Being what you say: The effect of essentialist linguistic labels on preferences. *Social Cognition*, 22, 193–213. doi:10.1521/soco.22.2.193.35463
- Wigboldus, D. H. J., & Douglas, K. M. (2007). Language, stereotypes, and intergroup relations. In K. Fiedler (Ed.), *Social communication* (pp. 79 -106). New York, NY: Psychology Press.
- Willems, R. M., Hagoort, P., & Casasanto, D. (2010). Body-specific representations of action verbs: Neural evidence from right- and left-handers. *Psychological Science*, 21, 67–74. doi:10.1177/095679760935407
- Ybarra, O., Chan, E., Park, H., Burnstein, E., Monin, B., & Stanik, C. (2008). Life's recurring challenges and the fundamental dimensions: An integration and its implications for cultural differences and similarities. *European Journal of Social Psychology*, 38, 1083– 1092. doi: 10.1002/ejsp.559

Table 1

Summary of Target Stimuli Used in Study 1 - Corpora Search with English Translations

Target group	Language	Agentic search targets	Non agentic search targets
Gender		Men, Man	Women, Woman
	Polish German	"Mężczyźni," "Mężczyzna" "Männer," "Mann"	"Kobiety," "Kobieta" "Frauen," "Frau"
Age		Young People	Old people
	Polish German	"Młodzi ludzie," "Młodzież" "Junge Menschen," "Junge Leute," "Jugendliche"	"Starzy ludzie," "Emeryci" "Alte Menschen," "Alte Leute," "Senioren"

Table 2

Summary of Corpora Search Results (Study 1)

			Total	With Verbs	Proportion	Odds
Gender						
Polish	Men	67,460	10,684	0.158	0.188	
	Women	94,594	10,882	0.115	0.130	
	$\chi^2(1) = 641.01, p < .001$					
	Men	518,321	85,305	0.165	0.197	
German	Women	675,018	97,326	0.144	0.168	
	$\chi^2(1) = 941.01, p < .001$					
Age						
Polish	Young people	20,592	3,495	0.170	0.204	
	Old people	2,228	131	0.059	0.062	
	$\chi^2(1) = 185.11, p < .001$					
	Young people	176,400	26,770	0.152	0.179	
German	Old people	86,519	11,081	0.128	0.147	
	$\chi^2(1) = 264.15, p < .001$					

Note. Total = frequency of target words (A); With Verbs = frequency of target words immediately followed by a verb (B); Proportion=B/A; Odds=B/(A-B).

Table 3

List of Stimuli Used in the Experiments (GC Indicates Grammatical Category of v- Verbs, a- Adjectives, n- Nouns)

	List 1	GC	List 2	GC	List 3	GC
Stimuli lists for Study 2 and 3 (in bold)	nefkiczyc	v	nefkickie	a	nefkistwo	n
	szopfute	a	szopfustwo	n	szopfic	v
	bultestwo	n	bultewic	v	bultewne	a
	leszdic	v	leszdune	a	leszdustwo	n
	beklowne	a	beklostwo	n	beklowac	v
	kechnystwo	n	kechnowac	v	kechnyckie	a
	dyzmuwac	v	dyzmuwskie	a	dyzmustwo	n
	chynfowskie	a	chynfostwo	n	chynfowac	v
	tyzjastwo	n	tyzjowac	v	tyzjawskie	a
	fumzic	v	fumzięte	a	fumziestwo	n
	nytczackie	a	nytczastwo	n	nytczowac	v
	rećwustwo	n	rećwic	v	rećwute	a
	jużbować	v	jużbuckie	a	jużbustwo	n
	bunrowne	a	bunrostwo	n	bunric	v
	fumlystwo	n	fumlic	v	fumlyte	a
Stimuli lists for Study 4	List 1	GC	List 2	GC	List 3	GC
	nefkiczyc	v	nefkidło	n (neut)	nefkickie	a (neut)
	tyzja	n (fem)	tyzjawskie	a (neut)	tyzjowac	v
	dyzmuwskie	a (neut)	dyzmuwac	v	dyzmudło	n (neut)
	fumzic	v	fumzyt	n (masc)	fumzięty	a (masc)
	szopfudło	n (neut)	szopfuty	a (masc)	szopfic	v
	fumlycki	a (masc)	fumlic	v	fumlyt	n (masc)
	jużbować	v	jużba	n (fem)	jużbocka	a (fem)
	chynfyt	n (masc)	chynfowska	a (fem)	chynfowac	v
	nytczacka	a (fem)	nytczowac	v	nytcza	n (fem)

Table 4

Means and Standard Deviations for the Dependent Variables in Studies 2 to 4 by Grammatical Category Condition

		Verbs		Adjectives		Nouns	
		<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Study 2	Agency/communion	0.61	0.22	0.48	0.23	0.50	0.24
Study 3	Agency	1.44	1.84	0.21	1.62	0.18	1.76
	Communion	0.13	1.50	-0.10	1.55	-0.57	1.72
	Abstractness	0.45	2.22	0.60	2.15	0.44	2.06
	Valence	0.09	1.57	0.05	1.62	-1.14	1.85
Study 4	Agency	0.24	2.07	0.10	1.57	-0.17	1.56
	Communion	-0.37	1.88	0.14	1.60	-0.37	1.52
	Abstractness	0.26	2.10	0.34	2.10	-0.16	2.32
	Valence	-0.82	1.94	0.08	1.65	-0.50	1.79

Note. In Study 2, Agency-Communion was assessed with a forced choice item with communion coded as 0 and agency coded as 1. Higher values indicate a stronger tendency toward agency choices.

Table 5

Summary of Two-Level Logistic Regression Analysis Predicting Forced Choice Outcomes in Study 2.

Predictor	<i>B</i>	<i>SE</i>	Odds Ratio
<i>Within level</i>			
Contrast 1	0.16**	0.06	1.17
Contrast 2	-0.05	0.09	0.95
<i>Between level</i>			
Threshold	-0.11*	0.05	
Residual variance	0.00	0.00	

Note. Contrast 1 contrasts verbs (coded as 2) with adjectives and nouns (both coded as -1). Contrast 2 contrasts adjectives (1) with nouns (-1). The forced choice dependent variable was coded with communion = 0 and agency = 1.
*** $p < .001$; ** $p < .01$; * $p < .05$.

Running head: LINGUISTIC MARKERS OF AGENCY

36

Table 6
Estimates and Fit Indices for Saturated and Constrained Model in Studies 3 and 4

	Study 3 - saturated		Study 3 - constrained		Study 4 - saturated		Study 4 - constrained	
	<i>Estimate</i>	<i>SE</i>	<i>Estimate</i>	<i>SE</i>	<i>Estimate</i>	<i>SE</i>	<i>Estimate</i>	<i>SE</i>
<i>Within level - Agency</i>								
Contrast 1	0.37***	0.07	0.37***	0.07	0.15*	0.06	0.16**	0.06
Contrast 2	-0.07	0.11	0.00	0.00	0.06	0.08	0.00	0.00
Valence	0.17**	0.05	0.16**	0.05	0.26***	0.04	0.27***	0.04
Abstractness	-0.13***	0.03	-0.13***	0.03	0.00	0.03	0.003	0.03
<i>Within level - Communion</i>								
Contrast 1	0.07	0.06	0.00	0.00	-0.02	0.53	0.00	0.00
Contrast 2	0.02	0.08	0.00	0.00	0.13	0.07	0.00	0.00
Valence	0.36***	0.04	0.36***	0.04	0.40***	0.03	0.41***	0.03
Abstractness	0.03	0.03	0.02	0.03	0.05*	0.02	0.05*	0.02
Agency with Communion	0.57*	0.25	0.57*	0.25	0.72**	0.22	0.73**	0.22
<i>Residual Variances</i>								
Agency	4.97***	0.44	4.97***	0.44	5.90***	0.42	5.91***	0.42
Communion	4.37***	0.36	4.39***	0.36	4.64***	0.35	4.66	0.36
<i>Between level</i>								
Agency	0.60***	0.12	0.60***	0.12	0.06	0.10	0.06	0.10
Communion	-0.19*	0.10	-0.19*	0.10	-0.22*	0.09	-0.22*	0.09
Agency with Communion	0.42*	0.19	0.42*	0.19	0.23	0.12	0.22	0.12
<i>Residual Variance</i>								
Agency	0.89**	0.30	0.89**	0.30	0.49*	0.20	0.49*	0.20
Communion	0.49**	0.16	0.49**	0.16	0.39**	0.13	0.38**	0.13
<i>Model Fit</i>								
$\chi^2(df)$			2.16 (3)				3.06 (3)	
χ^2 p-value			0.54				0.38	
RMSEA			0.0				0.0	
CFI			1.0				1.0	
TLI			1.0				1.0	
SRMR _w			0.01				0.01	
SRMR _B			0.002				0.002	

Table 7
Frequency Summary of Selected Agent Nouns and Infinitives in Three English Corpora

Word	BYU-BNC	COCA	GLOWBE
eater / to eat	109 / 2762	714 / 15987	2953 / 70790
smoker / to smoke	184 / 265	1292 / 1535	4804 / 4924
runner / to run	666 / 4533	3563 / 23933	15699 / 94914
voter / to vote	279 / 1105	5059 / 9476	29599 / 57190
cheater / to cheat	7 / 93	306 / 752	1567 / 4370
a program / to program	354 / 56	8127 / 597	17950 / 2373
a trace / to trace	213 / 513	1453 / 1268	2435 / 4651
a rush / to rush	337 / 303	1907 / 1451	4729 / 5590
a taste / to taste	431 / 285	2493 / 5884	9321 / 6707
a whip / to whip	83 / 63	334 / 484	918 / 1961

Note. BYU-BNC = British National Corpus. COCA = Carpus of Contemporary American English. GLOWBE = Corpus of Web-Based Global English

¹ In a more refined version of the LCM (e.g., Wigboldus & Douglas, 2007; Semin & Fiedler, 1991) another category is mentioned, namely state action verbs (SAV). This is an ambiguous category in the LCM framework. For instance, in the Linguistic Category Model coding manual (Coenen, Hedeboew, & Semin, 2006 – page 7) it is written, that “Because SAVs are very similar to IAVs they are often treated as IAVs. Moreover, these types of verbs don’t differ significantly in abstraction level (Semin & Fiedler, 1991).” With the example “Person X thinks about this topic” it is evident, that also state action verbs convey a sense of agency and dynamism (a specific topic for a temporary time). This distinction highlights that action verbs dominate the grammatical category of verbs and substantiate our claim that a prototypical verb refers to an action. We will return to a discussion of state verbs, the smallest and arguably atypical verb category, in the general discussion.

² The results remain robust, however, when including these auxiliary words in the analyses (*Gender Polish*: Odds Ratio = 1.34, 95%CI = [1.30; 1.37], *Gender German*: Odds Ratio = 1.34, 95%CI = [1.32; 1.35], *Age Polish*: Odds Ratio = 2.24, 95%CI = [1.97; 2.56], *Age German*: Odds Ratio = 1.25, 95%CI = [1.22; 1.28]).

³ For German, we ran a supplemental analysis with a smaller archive (Tagged-M), which allowed for more detailed search criteria to maximize the likelihood that the verb referred to the intended target words. The verb characteristics were specified as follows: active voice, 3rd or 1st person singular or plural (matching the target). Even with these restricted criteria, the targets characterized by high agency were more frequently followed by verbs than the targets characterized by low agency (Gender: Odds Ratio = 1.21, 95%CI = [1.12; 1.31], Age: Odds Ratio 1.41, 95%CI = [1.03; 1.92]).

⁴ The experiments adhere to the APA ethical guidelines and were approved by an institutional ethics board at the University of Humanities and Social Sciences (number of the approval 24/IV/11-12).

⁵ Note that in Polish, words unequivocally are categorized to grammatical categories (e.g., the help and to help would be different words *pomoc* and *pomagać* in Polish).

⁶ An alternative analysis was run in which verbs were contrasted separately against adjectives and nouns (with two dummy variables coding verbs as the reference category). The results were in accord with the hypothesis. Both adjectives ($B = -0.53$; $SE = 0.20$; $p = .007$) and nouns ($B = -0.43$; $SE = 0.19$; $p = .03$) were seen as less agentic than verbs.

⁷ When the judgments of the extent to which artificial words reminded participants of the real grammatical categories were included in the main analysis, the overall pattern of results was preserved and the role of similarity to real grammatical categories on the judgments of agency and communion was negligible.

⁸ An alternative analysis was run with two dummy codes using verbs as the reference category. The first dummy variable compared adjectives, the second variable compared nouns to the verb category. The results were in accord with the hypothesis. Both adjectives ($B = -1.19$; $SE = 0.21$; $p < .001$) and nouns ($B = -1.05$; $SE = 0.24$; $p < .001$) were seen as less agentic than verbs. Compatible with the main analysis, neither adjectives nor nouns differed from verbs in terms of communion (both $ps > .25$). When non-significant paths were set to 0 and an equality constrain was placed on the paths leading from the dummy variables to agency, the model had a very good fit $\chi^2(4) = 2.70$; $p = .61$; RMSEA = .00; CFI = 1. The results corroborate the hypothesized basic model and indicate that the verb-agency link holds equally for comparisons with adjectives and nouns.

⁹ An alternative analysis was run in which two dummy codes were created. The first dummy category compared adjectives, the second category compared nouns to the verb category. The results were in accord with the hypothesis. Both adjectives ($B = -0.40$; $SE = 0.20$; $p = .04$) and nouns ($B = -0.52$; $SE = 0.20$; $p = .008$) were seen as less agentic than verbs. Compatibly with the main analysis, neither adjectives nor nouns differed from verbs in terms of communion (both $ps > .32$). When non-significant paths were set to 0 and an equality constrain was placed on the paths leading from the dummy variables to agency, the model had a very good fit $\chi^2(4) = 2.41$; $p = 0.66$; RMSEA = .00; CFI = 1. The results corroborate the hypothesized basic model and indicate that the verb-agency link holds equally for comparisons with adjectives and nouns.

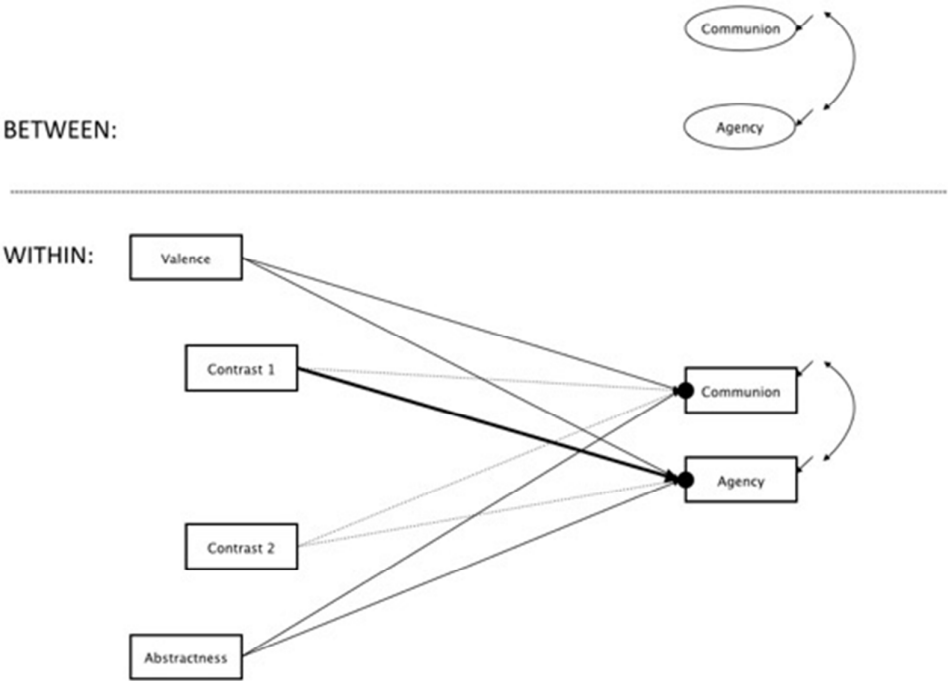


Figure 1. Conceptual model tested in Study 3 and 4. Contrast 1 contrasts verbs (coded as 2) with adjectives and nouns (both coded as -1). Contrast 2 contrasts adjectives (1) with nouns (-1).