The Role of Semantic Transparency in the Processing of Verb-particle Constructions by French-English Bilinguals

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Abstract

Verb-particle constructions (phrasal verbs) are a notoriously difficult aspect of English to acquire for second-language (L2) learners. This study was conducted to assess whether L2 English speakers would show sensitivity to the subtle semantic properties of these constructions, namely the gradations in semantic transparency of different verb-particle constructions (e.g., finish up vs. chew out). L1 French, L2 English bilingual participants completed an off-line (explicit) survey of similarity ratings, as well as an on-line (implicit) masked priming task. Bilinguals showed less agreement in their off-line ratings of semantic similarity, but their ratings were generally similar to those of monolinguals. On the masked priming task, the more proficient bilinguals showed a pattern of effects parallel to monolinguals, indicating similar sensitivity to semantic similarity at an implicit level. These findings suggest that the properties of verb-particle constructions can be both implicitly and explicitly grasped by L2 speakers whose L1 lacks phrasal verbs.

Keywords: Verb-particle constructions; bilingualism; semantic ratings; second language; masked priming.

Introduction

Verb-particle constructions, also known as phrasal verbs[1], are semantic units composed of a verb and a particle, which may be superficially similar to either a preposition (e.g., *turn out of the house*) or an adverb (e.g., *break the question down*). Common examples in English include THROW OUT, LOOK UP, CHEW OUT, FINISH UP, PULL OVER, and hundreds of others. These expressions are extremely common in some languages (e.g., English, German), though notably absent in others (e.g., French, Spanish, Italian). The language-specific properties of this phenomenon make it of interest to research in both monolingual and bilingual psycholinguistics. Current bilingualism research has demonstrated that non-native speakers have particular difficulty using these constructions, but has not yet identified the source of this difficulty. The present study was thus designed to investigate one aspect of verb-particle constructions that has been shown to affect monolinguals' processing: semantic transparency of the construction, which ranges from transparent (e.g., *finish up)* to opaque (e.g., *chew out)*. Semantic transparency was investigated using both an explicit and an implicit measure, to determine the level of processing where monolinguals and bilinguals differ.

[1]While some authors prefer one or the other for various reasons, in this text the terms "phrasal verb" and "verb-particle construction" will be used interchangeably.

The Nature and Processing of Phrasal Verbs

Semantically, phrasal verbs are generally assumed to be stored as units in the lexicon, similarly to words or idioms (e.g., Jackendoff, 1995). That is, the meanings of such expressions are memorized holistically, separately from the meanings of the component words. There is much less consensus, however, as to whether these units are processed lexically in the same way as any other word, or whether syntactic processing is also necessary. Arguments based on traditional linguistic analysis have shed some light on this issue, but have been ultimately inconclusive. For example, phrasal verbs are amenable to processes of derivational morphology, changing from verbs into nouns in expressions such as "a show-off," "a fixer-upper" or "a passer-by" (e.g., Farrell, 2005). On the other hand, the verb and particle are clearly distinct units in the sentence that can be separated both by a noun phrase (e.g., *throw it out*) and by an adverb (e.g., *fixed it right up*). This type of insertion should not be possible within a single word, according to the so-called Lexical Integrity Principle (Chomsky, 1970); thus, in this sense verb-particle constructions behave similarly to syntactic phrases.

More recently, researchers have approached this question of whether verb-particle constructions are more phrase-like or word-like, using psycholinguistic and neuroimaging techniques. For example, Konopka and Bock (2009) showed that word order preferences for verb particles can be structurally primed; participants were more likely to remember a sentence as having an adjacent (or non-adjacent) verb and particle if they had just seen a different sentence with the same structure. This finding, which held regardless of the idiomaticity of the construction, was taken as evidence for more structurally-based accounts of phrasal verb processing. A different conclusion was drawn by Cappelle, Shtyrov and Pulvermuller (2010), who used magnetoencephalograpy (MEG) to record neural responses to verb-particle pairs that were congruent (e.g., *heat up*) or incongruent (e.g., *heat down*). The mismatch negativity responses to these pairs were comparable to responses patterns typically elicited by words, rather than sentences.

The authors concluded that at a neural level, phrasal verbs are processed lexically rather than syntactically. Thus, both linguistic and neuro-cognitive methods have yielded mixed results with regard to the nature of phrasal verb processing.

An alternative perspective holds that this strictly modular view of the lexicon versus the syntax creates a false dichotomy that fails to account for the behavior of verb-particles. For example, in an effort to conform them to these designations, many researchers have categorized phrasal verbs as either "transparent," that is, interpretable based on knowledge of the component words, or "idiomatic," having an opaque meaning that can only be memorized (e.g., Dagut & Laufer, 1985). However, it has recently been recognized that an entire spectrum exists between these two extremes. Gonnerman and Hayes (2005) asked native English speakers to rate, on a scale of 1-9, the degree of similarity between a verb-particle construction and its component verb alone (e.g., "How similar is *carry off* to *carry*?"). Their participants gave highly consistent ratings that were distributed through the entire range of the scale. For example, the pair *finish up/finish* was considered to be very similar while *chew out/chew* was rated as highly dissimilar. Other items, such as *look up/look* were generally rated around the middle of the scale.

In the same study, the authors tested participants' implicit sensitivity to dependency using masked priming, an on-line task. Participants were asked to make a lexical decision to target words presented visually on a computer screen. Before each target, a prime consisting of another word or word combination was presented for 35ms, long enough to be processed subliminally but too short to be recognized consciously. Lexical decisions were facilitated when a target verb (e.g., *finish*) was primed by a low-dependency verb particle construction (e.g., *finish up*), but not when the target (e.g., *chew*) was primed by a high-dependency construction (e.g., *chew out*). Thus, these participants were shown to recognize dependency variations in both offline and on-line semantic processing.

Processing in Second-language (L2) Learners

Phrasal verbs have long been recognized as among the most difficult aspects of English to acquire for second-language (L2) learners, and are also therefore of interest to those in the English as a Second Language (ESL) teaching profession (Neagu, 2007). Several researchers have investigated this phenomenon in bilinguals, though most of this work has focused on the avoidance of verb-particles in production. For example, Dagaut and Laufer (1985) found that in written English tasks, native Hebrew speakers tended to avoid phrasal verbs (e.g., *let down*) in favor of single-verb synonyms (e.g., *disappoint*). While the authors attributed this effect to the lack of verb-particle constructions in Hebrew, subsequent studies have shown that similar difficulties are experienced by learners whose native languages include phrasal verbs, such as Dutch (Hulstijn & Marchena, 1989) and Swedish (Laufer & Eliasson, 1992). For these speakers, however, phrasal verbs seem to be more easily acquired as a function of proficiency; advanced Dutch and Swedish learners display more native-like behaviour than either intermediates with the same L1s or advanced learners with L1 Hebrew. Thus, the difficulty of L2 English phrasal verbs appears to result from a compounding of factors that are both syntactic (inter-language differences) and semantic (inherent difficulty of acquiring idiomatic vocabulary). Later research (e.g., Liao & Fukuya, 2005; Gonzalez, 2010) has strengthened the hypothesis that avoidance of phrasal verbs decreases as English proficiency increases for all speakers, but that it does so more quickly for speakers with verb-particle constructions in their L1s.

Thus far, most investigations of verb-particles in L2 speakers have focused on production, particularly on the phenomenon of avoidance. However, it is equally important to investigate these structures at the level of receptive language processing. Comprehension of various linguistic structures precedes their production, both in first language (e.g., Benedict, 1977) and second language (e.g., Ringbom, 1992) acquisition, making this an important aspect of determining bilinguals' competence with phrasal verbs.

In one of the few studies of phrasal verbs in on-line L2 comprehension, Matlock and Heredia (2002) measured the time it took for non-native speakers with various L1s to read English sentences involving the same phrase in either a verb+preposition context (e.g., *John ate up the street*) or a verb+particle context (e.g., *John ate up the pizza*). While native English speakers and early bilinguals (i.e., having acquired English before age 12) reacted more quickly to verb-particle constructions, late bilinguals seemed to process phrases involving a literal preposition most easily. This was taken as evidence that in processing figurative language, native speakers and early bilinguals can activate a figurative meaning instantly while late bilinguals must first retrieve the literal meaning before seeking alternate interpretations. While promising, however, this study had several limitations. First, the authors' "on-line" measure was response time to an entire sentence, a relatively crude method which was unable to isolate the processing of the verb-particle construction itself. Moreover, first language and current proficiency level were not carefully controlled in this experiment.

A different, though related line of research is the study of idioms in second language comprehension. Like phrasal verbs, idioms consist of words that appear in other contexts but which take on a new meaning in a particular combination and a particular context. Given this similarity, it is not surprising that both types of constructions are difficult for second language learners. Models of monolingual idiom comprehension differ in the role they attribute to compositional versus non-compositional processes (see Titone & Connine, 1999, for a review); however, most current theories agree that native speakers may access either the literal or non-literal meaning of an idiom first depending on the construction itself as well as contextual and discourse factors (Giora, 2002; Titone & Connine, 1999). There is somewhat less consensus about

whether non-native speakers take full advantage of this complex processing strategy. One proposal (Cieslicka, 2006; Cieslicka & Heredia, 2011) is that the literal meanings of idioms enjoy universal salience for non-native speakers; that is, these speakers will always activate a literal interpretation before seeking an alternative reading. This "Literal Salience Hypothesis" is proposed to hold regardless of the context, familiarity, or decomposability of an idiom. However, not all researchers agree with this account (e.g., Bulut and Çelik-Yazici, 2004).

Thus, psycholinguistic studies suggest that both phrasal verbs and other types of non-literal language are processed in fundamentally different ways by native versus non-native speakers. However, there remains a significant need for more work describing the comprehension of L2 phrasal verbs. First, while work on idiom processing has made valuable contributions to this line of research, it must be recognized that full idioms, such as *kick the bucket* and *let the cat out of the bag*, differ from phrasal verbs in several important respects. While idioms constitute a large class of expressions with a great deal of variation in their syntax and flexibility, verb-particles pattern fairly regularly and behave much like literal verb-preposition combinations syntactically (Dixon, 1982). Some particles also behave more like morphemes in the sense that they can be applied productively; for example, the perfective UP can be applied to any verb that can be thought of as completive, yielding FINISH UP, WASH UP, GROW UP, ROLL UP, WRITE UP and many more. Thus, it might be expected that in interpreting verb-particles, as opposed to idioms, second-language learners would have additional sources of information (from regularities in the language) and may not rely so heavily on an initial literal interpretation.

Second, research on second language learning in general must distinguish between explicit and implicit language processes. The importance of dissociating these aspects of comprehension has been recognized at least as far back as Bialystok (1979), who found that while learners acquired both explicit and implicit knowledge of a new language, it was largely the explicit component that improved with increased instruction. This study also found that learners employed either their implicit or explicit knowledge depending on the processing demands of the task. More recently, Ellis (2005) emphasized the difference between these types of knowledge, which he defined using a variety of criteria including awareness, time available, attention, systematicity, certainty, metalinguistic knowledge, and learnability. This study found that explicit language ability was more strongly related to years of instruction, while implicit competence was correlated with age of acquisition.

Taken together, these results support the need to measure acquisition of a particular structure both implicitly and explicitly, an approach we have taken in the present study. The following experiments were conducted to test whether native speakers of French, a language that lacks verb-particle constructions, are sensitive to the same semantic variations recognized by native speakers.

Verb-particle Similarity Ratings

To measure bilinguals' sensitivity to the semantic transparency of verb-particle constructions, we used an explicit, off-line, similarity rating task. Past research (Gonnerman & Hayes, 2005) has shown that when asked to rate the similarity between verbs and their corresponding verb-particle constructions, native English speakers provide consistent ratings across a spectrum ranging from low (*chew out/chew*) to mid (*look up/look*) to high (*chew out/chew*) similarity. To determine whether L2 speakers are sensitive to this variability, we administered a similar survey to French dominant English bilinguals. This metalinguistic task was designed to measure participants' explicit knowledge of verb-particle semantics, which we predicted would be similar to, but less accurate than that of monolinguals.

Participants

34 adult (age 18-40) native speakers of Canadian French were recruited through web-based advertisements on a university research mailing list, and participated voluntarily. English proficiency was self-rated as either Beginner (n=1), Intermediate (n=9), Advanced (n=20) or Near-native (n=4). Participants also reported their age of first exposure to English, which ranged from 1 to 20 years, with a mean of 8.21 years.

Materials

78 verb-particle pairs were presented in an internet-based survey. Stimuli were selected from a larger set of 212 verb-particle constructions that were rated by monolinguals in Gonnerman and Hayes' (2005) study, and contained an even distribution of low (mean rating < 4), medium (4-6) and high (>6) similarity items as rated by the monolinguals. Particles (e.g., *up, on, off*) were evenly distributed among high, medium and low similarity items. In addition, items in each group were matched for the frequency (Kucera & Francis, 1967) of the verbs (e.g., *throw*), as well as for the frequency of verb-particle constructions in their entirety (e.g., *throw up*).

Procedure

Each participant rated all 78 items. Participants were asked to rate the similarity in meaning of verb particle/verb pairs on a scale from 1 (very dissimilar) to 9 (very similar). Instructions for this task included examples of highly similar as well as dissimilar pairs with corresponding ratings. Ratings were compiled electronically and analyzed for comparison with the ratings obtained from monolinguals by Gonnerman & Hayes (2005).

Results & Discussion

Similarity ratings of the 78 items from monolinguals and bilinguals are shown in Figure 1. Results are arranged in ascending order of the monolinguals' ratings. Monolingual and bilingual ratings are positively correlated with

correlation coefficient 0.707 (p<.01), indicating that bilinguals can make similar judgments of semantic similarity to native English speakers. Ratings from the bilinguals were fairly evenly distributed across the range of the scale; on average, participants chose each point on the scale between 6 and 10 times. Interestingly, ratings of the two groups agreed more consistently in the middle of the scale than at either end, with those of the lowest-similarity items being most discrepant.

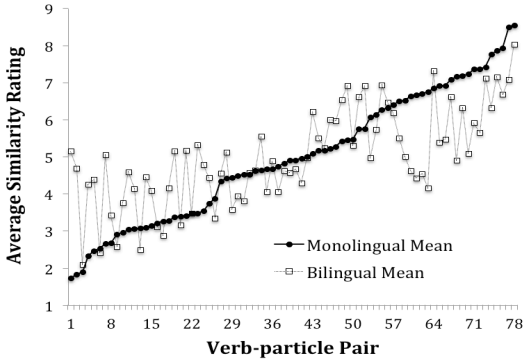

Figure 1: Mean semantic similarity ratings obtained from French-English bilinguals and English monolinguals from Gonnerman & Hayes' (2005). Verb/verb-particle pairs are arranged in ascending order of the monolinguals' mean ratings.

In other respects, bilinguals' ratings differed from those of the monolinguals. Bilingual speakers' ratings were significantly less consistent than monolinguals, with an average standard deviation of 2.33, as opposed to 1.96 for the monolinguals ($F(1,77)=56.16$, p<.001). Bilinguals' ratings also showed a reduced range (5.94), as compared to the monolinguals' range of 6.82. These results indicate that while second language speakers do recognize a range of semantic transparency across verb-particle constructions, they are generally more variable in their responses.

Masked Priming

As an on-line measure of semantic processing, participants completed a masked priming task in which a target verb (e.g., LOOK) was primed by its corresponding verb-particle construction (e.g., *look up*). In past research (Gonnerman & Hayes, 2005), priming has been found to be strongest for verb-particle constructions rated as highly similar in meaning to their isolated verbs. This task was designed to determine whether bilinguals' implicit processing of verb-particle constructions would be predicted by the degree of semantic transparency, as has been shown for monolinguals. In addition, the task serves as an implicit comparison to the explicit data obtained from the ratings task. If applicable to verb-particle constructions, the Literal Salience Hypothesis (Cieslicka, 2006; Cieslicka & Heredia, 2011), would predict poor performance on the priming task; Literal Salience holds that non-literal language is always first interpreted literally and only then re-analyzed, a process which would not have time to occur in a masked priming paradigm.

Participants

30 native speakers of French, aged 18 to 35, participated for monetary compensation. Inclusion criteria were identical to those of the similarity rating experiment: participants were required to consider themselves non-native speakers of English but to have functional proficiency in English. Age of first exposure to English ranged from 1 to 15 years, with a mean of 7.79 years. English proficiency was self-reported as Intermediate (n=7), Advanced (n=16) or Near-native (n=5).

Materials

The same 78 verb-particle constructions were used as related primes for their corresponding verbs (e.g., *cover up/cover*). For each construction, an unrelated control prime was created to match in frequency and number of letters (e.g., *show off/cover*). Control primes did not overlap with test primes in meaning or orthography. Finally, identity primes (e.g., *cover/cover*) were included for each item. Stimuli were divided into three lists, with one of these conditions in each list so that no participant responded to any verb more than once. In order to reduce the proportion of related prime-target pairs, 78 real word prime-target filler items were added to each list. In addition, 156 non-word filler items were included, matching the real words in frequency and orthography as closely as possible. Of these, half employed verb particle primes with non-words that were either "related" (e.g., *keep out/keem*) or "unrelated" (e.g., *live down/bool*), while the other half used single words as primes. Thus, each participant responded to 312 items, of which 39 were related prime-target pairs containing verb particle constructions.

Procedure

Participants were tested individually in a quiet room with dim, natural lighting. Stimuli were presented using PsyScope (Cohen, MacWhinney, Flatt, & Provost, 1993) software on CRT monitors running at 85 HZ. Each trial consisted of a fixation point (*) displayed for 1000ms, after which a mask (%#@!&^$) was displayed for 500ms; subsequently, the prime appeared briefly for 35ms followed immediately by the target, which remained on the screen for 200ms. Participants made a lexical decision to the target by pressing the yes/no buttons on a button box, from which reaction times were recorded. After the participant's response, a 500ms delay occurred before presentation of the next trial. Stimuli appeared in white on a black background, with primes in lower case letters and targets in upper case letters.

Results & Discussion

Four participants, who made errors on more than 40% of the items, were excluded from the analyses. For all other participants, only correct responses were included in the

analyses. Data were trimmed to exclude outliers; that is, response times slower than 300ms or faster than 1000ms. A 3 (Prime Type: Related vs. Unrelated vs. Identity) by 3 (Prime-target similarity: Low vs. Mid vs. High) repeated measures ANOVA was conducted to determine whether priming effects were modulated by semantic similarity. Because we were interested in priming effects specifically, we also planned comparisons between the unrelated and related response times. Priming effect for the monolinguals (from Gonnerman & Hayes, 2005) and bilinguals are shown in Tables 1 and 2 below. An identity condition was also included for the bilinguals to rule out the possibility that bilinguals are only reading the first word in the verb-particle primes, that is, reading only the first element (*e.g., throw)* and ignoring the particle separated by a space (*e.g. up*). Including the identity condition therefore allowed us to determine whether priming for related targets reflects the whole prime, since otherwise *throw off/throw* would simply elicit the same identity priming as *throw/throw*).

Results showed a significant main effect of Prime Type ($F(2, 50)=7.96$, $p<.01$) and a significant main effect of Similarity ($F(2, 50)=7.19$, $p<.01$). The interaction of these factors was non-significant. Planned comparisons revealed significant ($p<.05$) differences between the unrelated and identity primes across all conditions, and significant differences between the unrelated and related primes in the mid and high-similarity conditions (see Table 2 below).

Table 1: Monolinguals' response latencies for target words by prime type and similarity (from Gonnerman & Hayes, 2005).

Monolinguals	Prime-target Similarity		
Prime Type	Low	Mid	High
Unrelated (*cast off/throw*)	550	553	557
Related (*throw up/throw*)	543	532	537
Unrelated-Related	**7**	**21***	**20***

Table 2: Bilinguals' response latencies for target words by prime type and similarity.

Bilinguals	Prime-target Similarity		
Prime Type	Low	Mid	High
Unrelated (*cast off/throw*)	605	619	605
Related (*throw up/throw*)	592	599	576
Identity (*throw/throw*)	583	595	569
Unrelated-Identity	22*	24*	36*
Unrelated-Related	**13**	**20***	**24***

Tables 1 and 2 show the response latencies from monolingual and bilingual participants to unrelated, related and (for the bilinguals) identity primes. Responses from the bilinguals were slower overall, consistent with the increased processing cost of responding in one's second language. In all other respects, however, results from the two groups are strikingly similar. In addition, for the bilinguals identity priming across all three conditions was higher than Unrelated-Related priming, indicating that the bilinguals did in fact respond differently to the verb-particle constructions than to the verbs alone. As did the monolinguals, the bilingual speakers showed no priming effect for low similarity items, but significant facilitation from verb-particles rated as having mid or high similarity to the target verbs. These results suggest that, contrary to our expectations, at an implicit level L2 speakers are sensitive to the same gradations in semantic transparency that are reflected in monolingual priming effects.

General Discussion

The present study was designed to investigate the performance of non-native English speakers on implicit and explicit measures of phrasal verb comprehension. Based on past research, we hypothesized that the bilinguals would have difficulty with both tasks, showing decreased sensitivity to the variations in verb/verb-particle similarity that are easily recognized by monolinguals.

Somewhat surprisingly, responses of the L2 speakers approximated those of monolinguals on both the explicit and implicit semantic tasks. This native-like behaviour supports the findings of past research (e.g., Laufer & Eliason, 1992; Liao & Fukuya, 2005) demonstrating that non-native speakers can improve their competence with verb-particle constructions regardless of L1. Importantly, it also extends this literature from production to comprehension, suggesting that use of these constructions reflects their mastery even at a subconscious level. Nevertheless, it should be noted that bilingual responses were not identical to those of monolinguals, especially in the variability between participants on the similarity rating task. More research is needed to determine whether this reflects a fundamental difference between monolinguals and bilinguals, or whether even this effect might disappear in high-proficiency L2 speakers.

The results from the masked priming experiment do not support an extension of the Literal Salience Hypothesis (Cieslicka, 2006; Cieslicka & Heredia, 2011) to verb-particle construction processing in L2. Being below the consciousness threshold, the presentation length of the primes in this experiment was considered brief enough to measure initial, automatic interpretation. Thus, if bilingual speakers universally activated the literal meaning of a verb without considering it in conjunction with a particle, then identical priming would be expected for verb-particle constructions and identity primes across conditions. In contrast, our participants showed consistently higher priming for identity primes than for related verb-particle primes. Additionally, the difference between high and low/mid similarity items can only be explained if participants were responding to the construction as a unit and not simply to the literal combination of words. These data suggest that the literal salience account of idiom

processing in bilinguals does not apply to processing of verb-particle constructions.

When comparing the present study to past research, it should be noted that the bilingual participants in this study had a somewhat different language experience than those in most previous studies of phrasal verb acquisition (e.g., Dagut & Laufer, 1985; Hulstijn & Marchena, 1989; Laufer & Eliason, 1992). While past research has largely focused on speakers learning English in a formal or foreign-language setting, our participants were inhabitants of Montreal, where both French and English are regularly used in formal/educational as well as informal contexts. Thus, although context of exposure was not explicitly controlled in our study, it is reasonable to expect that most of our participants had (either currently or at some point in the past) some degree of contact with and use of English in everyday speaking situations. The present study therefore offers an important extension of work on L2 phrasal verbs to a bilingual population more apt to use English in informal as well as formal contexts.

Several possible directions for future research are suggested by the present study. Gonnerman & Hayes (2005), have noted that variations in verb-particle similarity can influence speakers' word-order preferences, for instance, deciding whether a verb and particle should appear in an adjacent (e.g., *throw out the garbage*) or shifted (e.g., *throw the garbage out*) construction. A logical extension of this experiment would be to investigate whether bilinguals use semantic similarity to influence their word-order preferences. In addition, past work on avoidance of verb-particle constructions in bilinguals suggests a need for more careful comparison of bilinguals with different proficiency levels and ages of acquisition. Finally, evidence from both bilingual and monolingual processing must ultimately be integrated with theoretical models of cognitive/linguistic function, addressing such issues as the interface between the lexical and semantic systems.

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