Acta Psychologica 171 (2016) 110–117

Contents lists available at ScienceDirect

Acta Psychologica

journal homepage: www.elsevier.com/locate/actpsy

The role of fluency in preferences for inward over outward words

Giti Bakhtiari [a], Anita Körner [a,*], Sascha Topolinski [b]

[a] Department of Psychology II, University of Wuerzburg, Roentgenring 10, 97070 Wuerzburg, Germany
[b] Department of Psychology, Social and Economic Cognition, University of Cologne, Richard-Strauß-Str. 2, 50931 Cologne, Germany

ARTICLE INFO

Article history:
Received 11 January 2016
Received in revised form 29 September 2016
Accepted 20 October 2016
Available online xxxx

Keywords:
Fluency
Articulation
In-out effect
Embodiment
Mediation

ABSTRACT

The present studies examined a novel explanation for the in-out effect, the phenomenon that words with inward wanderings of consonantal articulation spots are preferred over words with outward wanderings. We hypothesized that processing fluency might account for the in-out effect instead of, or in addition to, the originally proposed mechanism of motor-associated motivational states. Inward words could be more fluently processed than outward words, which could lead to the preference effect. Corpus analyses (Studies 1a and 1b) revealed more inward than outward words in English and German, which could account for their differing fluency. Additionally, inward compared to outward words were pronounced faster (Study 2) and were rated as being easier to pronounce (Studies 3a and 3b), indicating greater fluency. Crucially, a mediation analysis (Study 4) suggests that the influence of consonantal direction on preference was partially mediated by fluency. However, accounting for the influence of fluency still left a significant residual in-out effect, not accounted for by our fluency measure. This evidence supports a partial causal contribution of articulation fluency to the in-out effect.

1. Introduction

The sound of a word can confer information about the word's meaning. In addition to the phenomenon of onomatopoeia, where sounds resemble the meaning of a word (Bredin, 1996), more subtle connections exist as well. For example, in nonsense words, the shape of consonants has been found to influence which objects get associated with the words: words containing soft consonants (e.g., BOUBA) get associated with round shapes, while words containing hard consonants (e.g., KIKI) get associated with sharp-edged shapes (Köhler, 1947; Ramachandran & Hubbard, 2001). Moreover, easy-to-pronounce words are preferred over hard-to-pronounce words (Laham, Koval, & Alter, 2012) and when used as names for chemicals are judged less toxic (Song & Schwarz, 2009).

A recent study introduced a new association between nonsense words and preferences—the *in-out effect* (Topolinski, Maschmann, Pecher, & Winkielman, 2014). Words whose articulation points wander from the front to the rear in the mouth were evaluated more positively than words containing the same phonemes but arranged so that the articulation spots wander from the rear to the front in the mouth. The preference for inward over outward wandering words was replicated across several experimental set-ups, for both English and German speaking participants (Topolinski et al., 2014); has been replicated by independent research groups in English (Kronrod, Ackerman, & Lowrey, 2014) and Portuguese (Godinho & Garrido, 2015); and has been extended to listening instead of speaking or reading inward (vs. outward) wandering words (Topolinski & Boecker, 2016a). Moreover, it has been extended to willingness-to-pay for products, with inward wandering product names eliciting the willingness to pay higher prices than outward wandering product names (Topolinski, Zürn, & Schneider, 2015); and to palatability ratings for food, with inward wandering food names eliciting higher palatability ratings than outward wandering food names (Topolinski & Boecker, 2016b).

The present work examines the underlying mechanism of the in-out effect. In general, reading a word automatically elicits a simulation of its articulation (e.g., Topolinski & Strack, 2009a; for sensorimotor simulation more generally, see Barsalou, 1999; Körner, Topolinski, & Strack, 2015). The in-out effect seems to rely on this articulation simulation, as it disappears for aphasia patients, who do not engage in articulation simulations (Topolinski et al., 2014). However, it is not clear how this articulation simulation of inward or outward words leads to different evaluations. Topolinski et al. (2014) suggested that simulating inward (vs. outward) movements elicits distinct motivational orientations, which lead to differing preferences. In the following, we examine processing fluency as an underlying mechanism for the in-out effect.

1.1. Motivational orientation as the proposed mechanism for the in-out effect

Given that oral motor movements are simulated when reading, Topolinski et al. (2014) explained the in-out effect with the fact that

* Corresponding author.
E-mail addresses: giti.bakhtiari@uni-wuerzburg.de (G. Bakhtiari), anita.koerner@uni-wuerzburg.de (A. Körner), sascha.topolinski@uni-koeln.de (S. Topolinski).

http://dx.doi.org/10.1016/j.actpsy.2016.10.006
0001-6918/

oral motor movements serve two main functions: articulation and ingestion (Rozin, 1999). Ingestion involves two basic oral behaviors, namely intake of edible substances via deglutition and ejection of harmful substances via expectoration (Hejnol & Martindale, 2008; Rosenthal, 1999; Rozin, 1996), with the former featuring sequential muscle movements wandering from the front to the rear, and the latter featuring muscle movements wanderings from the rear to the front of the mouth (Goyal & Mashimo, 2006). Importantly, both behaviors are clearly linked to valence. Deglutition is generally positive and expectoration negative (Rozin, 1996).

Articulation involves the same oral muscle movements (Steklis, Harnad, Harnad, Steklis, & Lancaster, 1976; Titze, 1994). For consonants, oral muscle contractions occur on well-defined spots varying on the oral plane, for instance, B and P in the front (the lips), and K in the rear (rear back of the tongue). By creating nonsense words that contain consonants in a specific sequence of articulation spots, oral muscle contractions can be generated by articulatory means that wander from the front the rear (e.g., MENIKA), or from the rear to the front (e.g., KENIMA), similar to the muscle dynamics in deglutition and expectoration, respectively.

Topolinski et al. (2014) argued that these shared muscular dynamics between ingestion and articulation are responsible for the in-out effect. The mere articulation of words with inward and outward consonantal wanderings induces motivational states that are associated with ingestion and expectoration. Specifically, according to Topolinski et al. (2014), reading an inward wandering word leads to approach motivation (via the association of ingestion and positive valence), while reading an outward wandering word, leads to avoidance motivation (via the association of expectoration and negative valence).

Although the in-out effect is robust, the proposed underlying mechanism or approach-avoidance-motivation is not yet established to drive the effect. Topolinski, Boecker, Erle, Bakhtiari, & Pecher (2015) pitted the influence of valence against situational affordances by assessing the liking of inward compared to outward words as names for positive (or negative) objects that afford ingestion (e.g., lemonade) or expectoration (e.g., bubble gum). They concluded that object affordances moderate the in-out effect while valence did not. However, if approach and avoidance orientation were responsible for the in-out effect, one could have expected a compatibility effect between valence and consonantal direction (inward vs. outward).

1.2. Processing fluency as a contributing mechanism to the in-out effect

Here, we propose and test an alternative mechanism for the in-out effect, motor fluency. The two consonantal directions (inward vs. outward) could vary in their motoric *processing fluency*—the ease and speed with which information is processed (Reber, Wurtz, & Zimmermann, 2004; Unkelbach, 2007). High fluency (easy and fast processing) of a stimulus seems to be hedonically positive. Various studies have shown that easy to process stimuli are preferred over hard to process stimuli (Diener, Larsen, Levine, & Emmons, 1985; Winkielman & Cacioppo, 2001; Zajonc, 1968). Similarly, fluent (compared to disfluent) movements trigger positive feelings (Cannon, Hayes, & Tipper, 2010; Leder, Bär, & Topolinski, 2012; McLean, Want, & Dyson, 2015; Sparenberg, Topolinski, Springer, & Prinz, 2012; Topolinski, 2010; Van den Bergh, Vrana, & Eelen, 1990). As articulation movements can also vary in the ease of execution (e.g., McKinney, 1982; see, Ann, 1996, for sign language), this varying motor fluency can influence attitudes toward the associated stimulus (Bakhtiari & Topolinski, 2015). Indeed, pronunciation ease as an indicator of oral motor fluency has been repeatedly shown to trigger positive attitudes (Alter & Oppenheimer, 2006, 2009; Topolinski, 2012; Topolinski, Erle, & Bakhtiari, 2016; Topolinski & Strack, 2009a, 2010; Vrana & Van den Bergh, 1995). Thus, if inward words were easier and faster to pronounce than outward words, processing fluency might contribute to the in-out effect.

There are two possible reasons why inward words might be more fluent than outward words. First, some movements are easier to execute than others due to mere biomechanics (e.g., Brand, Beach, & Thompson, 1981; Cruse, 1986; Nelson, 1983). Accordingly, swallowing might be motorically easier than expectorating because, in contrast to swallowing, expectorating involves a series of strong spasmodic muscle contractions (Lumsden & Holden, 1969). As oral motor fluency has been found to lead to positive evaluations, this could explain the in-out phenomenon. However, testing this biomechanical contribution to articulation ease is beyond a psychological examination.

Second, besides biomechanics, some movements might be easier to execute than others because they have been executed more often in the past. Movement training increases fluency and triggers positive feelings (Casasanto & Chrysikou, 2011; for the oral domain, see Topolinski & Strack, 2009a, 2010). A likely source for this articulation training lies in natural language (see also Cooper & Ross, 1975). Consonantal inward movements might be more frequent in natural language than outward movements. Moreover, as frequency in language affects the efficiency of language processing and particularly pronunciation ease (Balota & Chumbley, 1985; Berry, 1971; Brysbaert & New, 2009; Ellis, 2002; Forster & Chambers, 1973; Grainger, 1990; Savage, Bradley, & Forster, 1990), inward words could be processed more efficiently than outward words.

The present research tests this proposed mechanism: Language characteristics might lead to a greater fluency of inward over outward articulation movements. And this fluency difference might account, partially or completely, for the in-out effect.

2. Overview of the present research

The influence of fluency on the in-out effect reported by Topolinski et al. (2014) was systematically tested. First, to demonstrate the ecological source of fluency in natural language, Studies 1a and 1b analyzed corpus data of the English and German languages to explore the frequencies of consonantal inward and outward movements. Next, Study 2 tested experimentally whether inward words are easier to articulate than outward words; and Studies 3a and 3b examined whether these differences also hold for subjective fluency ratings. Finally, Experiment 4 tests whether ease of articulation (subjective fluency) mediates the influence of consonantal direction (inward vs. outward) on word evaluation.

3. Studies 1a and 1b: corpus analyses

The occurrence of consonantal inward and outward dynamics in the two languages addressed in Topolinski et al. (2014), English and German, were explored. Natural words sometimes feature systematic wanderings; for example, MASTER, STRIKE, and STRONG feature inward, and ACROSS, ACTIVE and CLAIM feature outward wanderings of several consecutive consonantal phonemes (International Phonetic Association, 1999). However, words like these are very rare and restraining the analysis to these cases would, therefore, limit the interpretability of the present analysis. Thus, we used the following logic to include most words. By definition, an inward word starts with a front consonant (e.g., B) and ends with a rear consonant (e.g., K). Conversely, an outward word starts with a rear consonant and ends with a front consonant. If a given word, for instance, starts with a rear consonant, whatever further consonantal sequences might occur, their overall trajectory can only be outwards (even if there are partial reversals).

Thus, by assessing the frequencies of front and rear consonants occurring as first and last consonants in natural words, we get a rough estimate of inward and outward dynamics.