Implicit causality of action verbs at the interface between conceptual structure and discourse coherence relations

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ABSTRACT Implicit causality of interpersonal transitive verbs (IC) pertains to preferences to attribute the cause of a given action to the subject or the object referent in active clauses. Causal attribution is operationalized as the probability of referential continuation in a subsequent explanatory clause. This paper presents an explorative investigation into the causal biases of action verbs, which in contrast to affective verbs have received less attention in IC research. We approach implicit causality as a discourse level phenomenon based on the textual level of discourse representation and enriched by conceptual knowledge. In study 1, we targeted IC effects of German action verbs (N = 52) in sentences containing causal, additive and adversative connectives. Results showed that IC based categories of subject- object-, and non-biasing predicates were clearly discernable in causal contexts only. In study 2, we examined effects of situational knowledge (physical affectedness & social acceptability) and affective appraisals (valence & arousal) represented in the conceptual structure of the verbs on the construal of causality biases and their interplay with immediate contextual information such as gender of referents. Results show that higher degrees of physical affectedness were associated with causal attribution to the object referent. This effect was modulated by the affective properties of the verbs. Our findings revealed the influence of physiological arousal, an affective dimension not considered in previous investigations of IC. Actions with a strong physical impact that were characterized by high arousal, e.g., *kick,* or *tickle* were more likely to be explained with reference to the subject. Participants also considered the available contextual information, as indicated by the significant interactions of gender information with arousal. Within the subsample of non-biasing verbs, higher estimates for social behavior increased probabilities of causal attributions to the subject.

Keywords: implicit causality, discourse relations, conceptual knowledge, valence, arousal

1   Introduction

Discourse interpretation is a dynamic process that proceeds more easily if the information added by consecutive utterances expands and modifies the represented situation model in predictable and relevant ways. The notion of discourse coherence thus reflects the cognitive effort to establish plausible relations between old and new bits of information. The accommodation of new information feeds inferential processes and shapes expectations about the unfolding discourse (Knott and Sanders, 1998; Mann and Thompson, 1986, 1988; Sanders, Spooren, and Noordman, 1992, 1993). On the level of linguistic expression, meaning relations can remain implicit, or they can be overtly guided by discourse connectives such as *and*, *while*, *because*, or *but.* Discourse connectives thus narrow down the range of possible interpretations by specifying the intended relation between old and new discourse segments. Moreover, research on referential discourse coherence has provided stable cross-linguistic evidence for the effects of different meaning relations on the interpretation of referential expressions in a given discourse segment (Kehler, 2002, 2004; Kehler, et al., 2008; Koornneef and Sanders, 2013; Sanders and Noordman, 2000, inter alia). These effects have been shown to be bidirectional – backward looking in terms of anaphora resolution, and forward looking in terms of expectations

about referential maintenance or shift (Arnold, 2001; Mak and Sanders, 2010; Mak, Tribushinina, and Andreiushina 2013; Pander Maat and Sanders, 2009).

The construal and the linguistic expression of causal relations have received comprehensive treatment in theories of discourse processing and in cognitive accounts of discourse coherence. Causal relations are represented at the level of a situation model derived from the textual levels of discourse representation and enriched through conceptual knowledge elements (Graesser, Millis, and Zwaan, 1997; Kintsch, 1998; Zwaan, Magliano, and Graesser, 1995; Zwaan and Radvansky, 1998). This finding pertains to a broad range of causal relations, which includes physical cause-effect chains, causal inferences based on temporal sequences and regularities of contiguous events, explanations of superordinate goals or reasoning about intrinsic and extrinsic motivation in social interaction (for a discussion of causality as a conceptual dimension in situation models, see Graesser, Millis, and Zwaan, 1997).

The representation of causal knowledge in the lexical meaning of verbs and its effects on the semantic and syntactic levels of linguistic representation have received extensive attention in the linguistic and psycholinguistic literature, since Garvey and Caramazza's (1974) investigation of causal attribution tendencies. The authors called the effect of causal reasoning on the interpretation of anaphoric pronouns *implicit causality*, hence IC. The phenomenon pertains to relatively stable tendencies for causal attributions to one of the protagonists in interpersonal events. In several subsequent studies (Caramazza, Grober, and Garvey, 1977; Garvey, Caramazza, and Yates, 1974), the research group presented evidence that the direction and the strength of causal attributions (subject- or object-bias) were influenced by manipulations of the linguistic context (passivization, negation, interrogation). Further, gender information provided in the linguistic context has been shown to affect causal attribution interacting in subtle ways with more general knowledge types and appraisals such as the gender of respondents, or the intrinsic pleasantness of interpersonal actions (Ferstl, Garnham, and Manouilidou, 2011; Mannetti and De Grada, 1991; Morera, De Vega, and Camacho, 2010; Semin and Fiedler, 1991, inter alia).

Implicit causality appeared to be a cross-linguistically stable feature of psychological verbs (for an overview and meta-analysis, see Hartshorne, Sudo, and Uruwashi, 2013). In positive active clauses such as *person A pleased person B*, emotion verbs like *please* regularly elicit explanations which attribute the pleasure of the referent syntactically realized in the object position to actions or characteristics of the referent occupying the subject position. Verbs incurring such interpretation have been termed subject-biasing or NP1-biasing verbs, as they are likely to maintain the first mentioned referent as subject in a subsequent explanatory subordinate clause (*A pleased B, because A ...*). Conversely, verbs like *admire* will preferably locate the cause of admiration within activities or properties of the object referent. Such verbs are called object-biasing or NP2-verbs. They alter the referential continuum by shifting attention to the object referent of the first clause by promoting it to the subject position in the subsequent *because*-clause (*A admired B, because B ...*).

Another verb class that has been found to feature implicit causality biases cross-linguistically comprises verbs of judgment communication such as *praise* or *criticize*. Praise or criticism is conceived of as an evaluative reaction to previous activities of the affected referent. Grasping this conspicuous causal element in the conceptual structure of these predicates, Rudolf and Försterling (1997) classified them with respect to the represented semantic roles as Agent-Evocator verbs, setting them apart from Agent-Patient verbs. Apart from this well-investigated subclass of predicates exhibiting a strong affective meaning, not much attention has been paid to IC in predicates denoting other types of interpersonal actions. The action verbs under scrutiny

in most studies were restricted mainly to the field of interpersonal communication, i.e., *telephone*, *flatter* (Au, 1986; Brown and Fish, 1983; Green and McKoon, 1995, inter alia).

Investigations into the IC of agentive verbs provided no conclusive support for the theory-driven assumption of causal attribution to the agent referent, since many action predicates exhibited a causal bias for the affected referent or no systematic causal bias (Corrigan 1993; Ferstl, Garnham, and Manouilidou, 2011; Mannetti and De Grada, 1991; Rudolf and Försterling, 1997).

The Lexical Category Model (LCM) proposed by Semin and Fiedler (1988, 1991) assumes a positive correlation between the degree of conceptual abstraction and the strength of causal biases represented in the verbal meaning. Verbs expressing abstract concepts such as psychological states exhibit strong patterns of causation, while those expressing concrete physical actions do not. The model addresses the inconsistencies in the causal attribution of agentive verbs by distinguishing two types of action verbs. At the lowest level of abstraction, descriptive action verbs such as *push* or *kick* are based on a physically invariant feature. For them the model predicts no IC biases, causality inferences for actions being driven by the specific situational context. Interpretative action verbs like *help* display a higher level of abstraction, and therefore more pronounced causality patterns. Their meaning comprises different types of concrete actions and an evaluative dimension. Although no further specified in the model, the evaluative dimension in the meaning of interpretative verbs is an important conceptual characteristic differentiating the two types of action verbs in the LCM. Empirical investigations, however, provided evidence against this assumption. Mannetti and De Grada (1991) showed that the Italian descriptive action verbs under scrutiny in their study were considerably affected not only by contextual information (gender of referents) but also by their psychological valence. Unpleasant actions were attributed more frequently to male than to female referents. Ferstl, Garnham, and Manouilidou (2011) reported similar findings for English action verbs.

The abstraction scale proposed in the LCM leaves the concrete action verbs and the causality patterns they might feature without an adequate explanation. Still, the conception of an evaluative dimension of verbal meaning influencing the construal of causal biases remains appealing and calls for further investigation into the nature of this relation. Psychological valence investigated in the literature so far represents just one aspect of it (Ferstl, Garnham, and Manouilidou, 2011; Mannetti and De Grada, 1991; Morera, De Vega, and Camacho, 2010; Semin and Fiedler, 1991). When descriptive action verbs like *carry* or *kick* depict interpersonal activities, they also may activate positive or negative appraisals in terms of social behavior, situating the actions on a continuum between altruism and aggression. Therefore, a finer grained approach to the evaluative dimension of action verbs might allow a better understanding of IC variation in sentences with agentive predicates.

In the present paper, we investigated implicit causality properties of interpersonal action verbs in German. With respect to IC, action verbs do not constitute a homogeneous class, as they comprise subject-biasing, object-biasing and non-biasing predicates (Kuehnast and Valcheva, 2012). In our view, implicit causality effects on referential cohesion are a discourse phenomenon, which thrives on the contextual information supplied by connectives, tense and aspect markers, or gender of nominal antecedents, enriched by aspects of conceptual knowledge underlying the verbal meaning. Therefore, we examined connective type and gender of the subject referent as factors of the immediate linguistic context. Further, we focused on factors pertaining to the conceptual structure of action predicates such as physical affectedness, evaluation of the action in terms of social behavior, and psychological valence and arousal as components of affective knowledge. Since we assume that IC effects arise from the integration

of multiple cues present in the discourse, we aimed at investigating possible interactions between elements of conceptual knowledge underlying the meaning of verbs and contextually given information such as gender of referents.

Study 1 aimed at determining patterns of IC in fifty-two German interpersonal verbs in a syntactic context overtly specified as expressing a causal coherence relation by means of the connective *weil* ('because'). Further, we investigated the persistence of the identified IC biases in sentential context, where the presence of the connectives *und* ('and') or *aber* ('but') favors the construal of additive and adversative coherence relations, respectively. We examined whether gender information presented in the immediate syntactic context of the predicates under scrutiny affects the referential choice in a systematic way and whether it interacts with the procedural information provided by the three connectives.

Study 2 investigated elements in the conceptual structure of action predicates, which have been discussed in linguistic and psychological approaches to IC as factors influencing causal reasoning. We were primarily interested in the correlation between the representation of causal regularities (IC biases) and four elements of conceptual knowledge, namely physical impact on the affected person (affectedness), social acceptability, gender of protagonists and affective appraisals of the interpersonal action.

Research on event structure of verbs has long recognized the notion of affectedness as a link between event conceptualization and verb semantics in terms of thematic roles and aspectual properties (Beavers, 2011; Fillmore, 1970; Jackendoff, 1990; Levin, 1993, Levin and Rappaport Hovav, 2005, inter alia). As Croft (2009) argues, type (*change of state* and *change in location*) and degree of affectedness play a major role for the conception of resultativity and thus for the aspectual categorization of predicates. Affectedness has also been considered a basic notion in definition of semantic roles, the differentiation of Patient and Theme being related to different types and degrees of affectedness (Levin and Rappaport Hovav, 2005). An investigation into the perceived affectedness of referents is supposed to contribute to our understanding of the conceptual features underlying the differentiated representation of semantic roles in German action verbs. The corresponding syntactic frames and the classification of verbs according to their argument structures play a basic role in accounts of IC in terms of lexical semantics promoted by Hartshorne (2014) and Hartshorne, O'Donnell, and Tenenbaum (2015). Taking into account that the authors did not include action verbs denoting concrete physical activities in their studies, the role of affectedness as a conceptual feature in the differentiation of verb frames clearly awaits further investigation.

As mentioned above, studies on the construal of causality attributions in action verbs show that the strength of the bias changes as a function of psychological valence of the depicted event. Verbal valence enters complex interactions with contextual and situational gender information suggesting that the construal of causal attribution for descriptive action verbs might be more sensitive to contextual influences than it is the case with more abstract activity and state verbs (Ferstl, Garnham, and Manouilidou, 2011; Franco and Arcuri, 1990; Mannetti and De Grada, 1991; Pandelaere, Hoorens, and Peeters, 2003). Such findings revealed the relevance of affective information for the allocation of motivation in interpersonal activities. Still, no attention has been paid to physiological arousal as a central affective dimension. Arousal pertains to changes in physiological activation of the person carrying out an action. Arousal is usually assessed on a scale from feeling calm to excited (Russell, 2003). Estimates of arousal reflect the affective state of the actor, whereas valence estimates encompass pleasantness appraisals of the event as experienced by the actor and to some extent as experienced by the affected person. In the experimental design of the present study, we operationalized the

affective factors by means of valence and arousal ratings available from external sources (BAWL-R: Võ, et al., 2009).

The evaluative dimension considered in some earlier studies conflated psychological valence and appraisals of social behavior (Mannetti and De Grada, 1991; Pandelaere, Hoorens, and Peeters, 2003). As pointed out above, the evaluative dimension of interpersonal activities might be more revealing on the nature of IC, when we consider aspects beyond psychological valence. Meanwhile research on valence and arousal as basic affective dimensions provided evidence for their specific effects and interactions that influence the representation of emotion terms in the affective space (Võ, et al., 2009; see Kuehnast, et al., 2014 for an illustration of the affective dimensions differentiating being-moved participles). Given the social nature of interpersonal actions, other evaluative aspects such as attitude and social perception need to be taken into account, when investigating action motivation. Studies approaching IC effects from the perspective of social cognition have suggested that causal and motivational attributions are guided by action evaluation based on culturally established norms of social conduct (Malle, 2011). Although often closely related, valence and social desirability pertain to different constructs. For instance, rescuing a person from a danger is not an intrinsically pleasant activity. Nevertheless, this action instantiates a highly acclaimed pro-social behavior. Viewing valence and social acceptability as different constructs pertaining to the evaluative dimension of interpersonal activities, we hypothesized that social acceptability might be a conceptual factor that explains IC inferences for action verbs beyond valence. To operationalize social acceptability judgments applying to interpersonal actions denoted by the German action verbs in our sample, we conducted a preliminary pen-and-paper study assessing interpersonal actions on a 7-point-Likert scale of social acceptability.

In the present investigation, we assess causal biases based on their effects on referential coherence expectations in upcoming discourse. In the specific context of interpersonal activities, however, discourse continuations attached by causal connectives shape expectations towards explanations of social interaction (Green and McCoon, 1995). Therefore, we will use the terms causal relations and implicit causality as notions particularly pertaining to reasoning about action goals and motivation in culturally shaped patterns of interpersonal behavior. This is an important consideration with respect to the task and the stimulus type most often used to investigate implicit causality effects on referential maintenance or shift in upcoming discourse, also called re-mention bias (Hartshorne, 2014). When asked to write continuations to simple Subject-Verb-Object clauses followed by *because*, participants actually solve a theory of mind task. They need to represent a situation model based on scarce contextual information in order to infer plausible reasons for the agent to carry out the action. As discussed by Bott and Solstad (2014) such explanations can be classified as agent-internal or agent-external reasons. Internal reasons explain the action at hand with reference to activities, attitudes or needs of the agent realized as a syntactic subject in active sentences. In this sense, Bott and Solstad's (2014) internal reasons pertain to the intrinsic motivation of a subject to carry out a given action. External reasons represent the action as a reaction to situation features such as time and place, or as a reaction to activities, needs, or dispositional properties of another referent syntactically realized in an object position.

In our view, the process of considering and allocating the motives for a given action either to the actor or to the affected person draws more attention to the respective referent and thus increases their salience in the situation model of the speaker. In line with salience accounts of referential cohesion (Ariel, 2014), we might reasonably assume that action predicates which elicit motivation attributions to the actor/subject in the main clause entail a referential subject-bias, while predicates commonly understood to depict actions as re-action to the activities or dispositions of the affected person entail a referential object-bias.

2 Experimental Study 1 – Context effects on the IC construal

The first explorative study aimed at determining implicit causality biases in a sample of German verbs ($N = 52$), which we assessed through the effect of causal reasoning on the referential continuity in subsequent clauses. It seems non-controversial that the representation of causal attribution hinges on the construal of causal/explanatory coherence relations, be they explicitly marked by the connective *because* or inferred in contexts without a connective or in the presence of temporal connectives (Bott and Solstad, 2014; Mulder and Sanders, 2012). Studies investigating a broader range of causal coherence relations presented evidence that connectives such as *so* or *and* shift attention to other elements of causal dependencies such as consequences and resulting states (Morera, De Vega, and Camacho, 2010; Stevenson, et al., 2000;). Such findings support the view that the referential continuity in a complex sentence depends on the extent of alignment between to the focusing effects of the coherence relation and causality biases of verbs.

In our study, we tested the persistence of causality biases in contexts featuring the additive connective *und* ('and') or the adversative connective *aber* ('but'). In German like in other Germanic languages, the basic connective *und* ('and') can mark a simple additive coherence relation but also a consecutive relation (Knott and Sanders, 1998; Sanders and Noordmann, 2000). As a coordinating conjunction, *und* ('and') exerts specific syntactic effects on pronominal resolution by supporting referential continuity, most prominently in elliptic constructions. Connective *aber* ('but') specifies a contrast relation and has been shown to induce a referential shift in pronominal resolution tasks by identifying the object referent as antecedent of an ambiguous overt subject pronoun in the coordinated clause (Koornneef and Sanders, 2013; Kuehnast, Roeper and Bittner, 2009; Mak, Tribushinina and Andreiushina, 2013). These studies also presented evidence for cross-linguistic differences in the outcome of pronominal resolution tasks due to the typologically different anaphoric systems, as well as to the range and division of labor between additive and adversative connectives in Bulgarian, German, Russian and Dutch.

Previous studies revolving around the nature of implicit causality biases have used additive and adversative connectives to test the persistence of IC biases or to manipulate their direction. Ehrlich (1980) reported that sentences coordinated by *but* reversed the IC bias of English verbs in a reading task. She interpreted this finding as indicative of a stable cause-consequence information represented in the lexico-semantic meaning of the verbs, which can be accessed and differently focused by means of causal and adversative connectives. Koornneef and Sanders (2013) investigated the influences on causal, additive and adversative connectives on the online processing of IC biases of Dutch verbs and found no reversing effect of the adversative connective. They attributed the different results to the range of contrastive coherence relations construed by the participants.

Taking an explorative approach to the representation and activation of causal information in German action verbs, we established two hypotheses concerning possible interactions between the information of an additive or an adversative connective and the implicit causality pattern of the predicates. Firstly, the contextual contribution of a connective might be a more reliable cue than the IC bias of the predicate, thus overriding verb specific causal expectations. Secondly, the focusing effect of the coherence relation indicated by the connective might align with the implicit causality bias of the predicate thus strengthening referential continuity or shift, respectively. Conversely, if not going in the same direction, the coherence relation might level the causality bias.

Several studies consider gender information present in the linguistic contexts as referents' gender and in the situational context as participants' gender to be a factor influencing the construal of causal inferences. In a causal attribution task applied in the study of LaFrance, Brownell, and Hahn (1997), male referents were more frequently identified as initiators of the events than female referents. Ferstl, Garnham, and Manouilidou (2011) used a sentence continuation task to investigate IC biases in three hundred English verbs in relation to gender information. They reported contextual gender effects and a significant interaction between participant's sex and referents' gender. Men selected more frequently male than female referents, irrespective of their syntactic role. In contrast, women chose more often the subject of the antecedent clause as a subject in the explanatory clause independently of the referent's gender. Importantly, there were individual verbs that exhibited specific gender effects by favoring either female, e.g., *answered, welcomed, rushed to*, or male referents, e.g., *escorted, hit, tormented*.

Goikoetxea, Pascual, and Acha (2008) examined IC biases of one hundred Spanish verbs using the classification of verbs also applied by Ferstl, Garnham, and Manouilidou (2011) that differentiates between activities and states. They found no general gender effect. Hartshorne (2014) also reports that the IC biases of the psychological verbs investigated in a series of experiments were not affected by the gender or the social role of referents as contextual factors.

The mixed findings concerning the role of contextually available gender information for the construal of IC might be due to different experimental methodologies (see Hartshorne, 2014 for a discussion of task-induced differences). Additionally, other factors such as size, scope and composition of the verb sample could influence the effect size. In the present investigation into the implicit causality of German action verbs, we explore the role of gender information in the construal of causal inferences within the narrow context of causal coherence relations. Further, we look into possible gender effects on referential continuity in meaning relations marked by additive and adversative connectives.

2.1 Method

2.1.1 Participants

The sample comprised 195 German native speakers (100 females), most of them university students. Mean age of the sample was 26 years, ranging from 19 to 56. There was no age difference between female and male participants, $t(194) = -.924$, $p = .36$.

2.1.2 Design and procedure

Our verb selection was based on previous studies of implicit causality biases in German (Bott and Solstad, 2014; Rudolf and Försterling, 1997), and on the normative studies of English (Ferstl, Garnham, and Manouilidou, 2011) and Spanish verbs (Goikoetxea, Pascual, and Acha, 2008). We were primarily interested in the representation of IC biases of interpersonal activities carried out deliberately. Therefore, we selected action verbs and psychological verbs with an agentive interpretation. Verbs of the latter group, e.g., *ärgern* ('to annoy') or *quälen* ('to torture') passed agentivity tests (passivization, acceptability in *deliberately* context) suggested in the literature (for a discussion, see Verhoeven, 2010).

Implicit causality biases of verbs have been studied by means of two kinds of tasks. Koornneef and van Berkum (2006) asked participants to write continuations to stimuli of the type *John*

disappointed Paul because he…, and subsequently to identify the antecedent of the pronoun by encircling the name. In the studies of Ferstl, Garnham, and Manouilidou (2011), Goikoetxea, Pascual, and Acha (2008), or Rudolf and Försterling (1997), participants were just asked to write meaningful continuations to stimuli of the type *Leo surprised Anna because…* which do not contain a pronoun. Referential choices in the produced continuations were disambiguated by means of the antecedents' gender difference. We decided to use the latter method because in German the use of personal pronouns in the stimuli would bias interpretation towards subject antecedents. German features a tripartite pronominal system – personal pronouns and two classes of proximal demonstrative pronouns – with a specific division of labor in terms of anaphora resolution (Bittner and Kuehnast, 2012; Bosch, Katz, and Umbach, 2007). Considering these typological properties, we used the gender difference expressed by a male and a female name in the stimulus clause to identify the referent selected in the continuations produced by the participants.

In contrast to the past tense stimuli (*A verb-ed B*) used in most studies, the verbs in our stimuli were in the present tense, e.g., *Peter trägt Simone, weil* … ('Peter carries Simone because…'). Past tense forms might bias the interpretation process by promoting resultative readings known to focus attention on the properties of affected objects and referents, or on the state they attain (Nedjalkov, 1988). We reasoned that present tense predicates are more likely to invoke a generic representation of the eventuality denoted by the verb.

To assess contextual effects on the construal of IC biases measured as frequency of subject reference (dependent variable), the experimental design included the factor connective type (because, and, but), gender of the subject antecedents (male, female). We constructed twelve lists containing thirty-nine stimuli counterbalanced for gender and connective type, e.g., *Peter trägt Simone, weil/und/aber* vs. *Simone trägt Peter, weil/und/aber …* ('Peter carries Simone because/and/but …' vs. 'Simone carries Peter because/and/but …'). The study was administered as a pen and paper task. Participants were asked to complete the sentence by writing down the first meaningful continuation, which came to their minds. Participants saw each verb in one condition only.

2.1.3 Data coding

Missing or illegible responses (3%) were excluded from the data set. The remaining responses were coded with respect to the referent selected as the subject of the produced clause. Referential identity between the subjects of the first and second clause was coded as 1 (subject continuation), otherwise as 0. If the subject phrase in the response clause depicted parts or properties of a particular referent, the response was evaluated to attribute the reason for the action to the specified referent. Therefore, responses like *Martha carries Tom because his legs hurt* were taken to express referential shift by highlighting properties of the object referent. Further, we identified responses referring to situational circumstances or new referents. These two response types were excluded from the computation of the causality bias of the verbs under scrutiny.

2.2 Results

Our first goal was to determine the implicit causality bias of the fifty-two verbs in the condition inducing a causal coherence relation by means of the German causal connective *weil* 'because'. There were approximately thirty valid responses for each verb in the causal condition ($M = 31$, range 29 – 33). For each verb, we performed a two-tailed χ^2-test on the distribution of subject

and object antecedents obtaining subject status in the produced explanatory clauses. We identified a subset of verbs ($N = 6$) which featured causal attribution to the subject referent ($M = 77\%$ subject antecedents, range 70% – 89%). There was a subset ($N = 24$) of object-biasing verbs which consistently prompted explanations based on activities or properties of the object antecedent ($M = 84\%$ object antecedents, range 71% – 100%).

Besides these two groups, there was a subset of verbs ($N = 22$) without a clear preference for referential continuity or shift according to their χ^2-values. In the following, we will refer to these verbs as non-biasing. Within the non-biasing verbs, we identified two verbs with a specific response pattern: *warnen* ('to warn') and *holen* ('to send for/to pick up'). At least one fourth of the explanations elicited by these predicates referred to the external circumstances of the action. Moreover, *holen* exhibited a meaning ambiguity as indicated in the given translational variants 'to send for someone/to pick up'. Therefore, we excluded these non-biasing verbs from further analysis, but we will touch upon their properties in the discussion.

After classifying the verbs into three groups of causal biases, we investigated whether referential choices in these IC groups were influenced by gender information. We computed a generalized linear mixed model with a logit link function modelling the subject choice. The model included Participants and Verbs as random factors. Further, we included the fixed factors, Gender of participants (male, female), Gender of the subject referent in the stimulus clause (male, female) and their interaction. There was a significant random effect of Participants ($z = 2.69$, $p = .007$) indicating substantial interpersonal differences, and of Verbs ($z = 3.89$, $p < .001$). Concerning the fixed effects, there were no significant effects of Participants' gender ($F = .48$, $p = .49$), or of the Referents' gender ($F = 3.68$, $p = .055$). The pairwise comparison revealed only a slight preference for causal attribution to male referents ($M = .35$) than to female referents ($M = .29$). The interaction of the two types of gender information was also non-significant. This result suggested that causality inferences in sentences containing the German action verbs under scrutiny were not markedly influenced by gender related expectations.

To address our hypotheses concerning the relation of coherence relations and IC patterns presumably represented in the lexical meaning of verbs, we investigated whether and how IC biases established in our sample affect the referential continuity in sentential contexts that express other types of coherence relations. We examined the referential choices, when continuations to the stimulus clauses were triggered by the additive connective *und* ('and') or the adversative connective *aber* ('but'). Table 1 shows the verb sample organized by bias type based on the referential preferences found in the *weil* 'because' condition.

Table 1: Proportion of references to the subject of the first clause

Verb type	Verb		Causal (*weil* 'because')		Adversative (*aber* 'but')		Additive (*und* 'and')	
			M	*SD*	*M*	*SD*	*M*	*SD*
Subject-biasing	*begrüßen*	'to welcome'	.80	.41	.14	.35	.90	.30
	berühren	'to touch'	.77	.43	.29	.46	.77	.43
	grüßen	'to greet'	.70	.47	.24	.44	.84	.37
	langweilen	'to bore'	.89	.32	.30	.47	.44	.51
	necken	'to tease'	.78	.42	.26	.45	.70	.47
	stören	'to disturb'	.70	.47	.21	.41	.77	.43
	Group mean		**.77**		**.24**		**.74**	
Object-biasing	*baden*	'to bathe'	.03	.18	.29	.46	.90	.31
	beißen	'to bite'	.29	.47	.28	.46	.66	.48
	erwischen	'to catch'	.23	.43	.34	.48	.86	.36
	fangen	'to catch'	.28	.46	.07	.26	.87	.35
	fesseln	'to tie'	.29	.46	.15	.37	.93	.25

füttern	'to feed'	.03	.17	.07	.26	.88	.33
hauen	'to strike/hit'	.17	.38	.47	.51	.83	.38
heben	'to lift'	.21	.41	.29	.46	.83	.38
jagen	'to chase'	.15	.36	.54	.51	.90	.30
kämmen	'to comb'	.12	.33	.09	.30	.94	.24
kneifen	'to pinch'	.16	.37	.09	.29	.48	.51
lieben	'to love'	.23	.43	.41	.50	.79	.42
loben	'to praise'	.00	.00	.30	.47	.97	.19
pflegen	'to care'	.10	.30	.27	.46	.81	.40
schaukeln	'to rock'	.07	.25	.22	.42	.72	.46
schieben	'to push'	.00	.00	.17	.38	.82	.39
schubsen	'to shove'	.28	.46	.27	.45	.57	.51
schütteln	'to shake'	.23	.43	.18	.39	.87	.35
schützen	'to protect'	.21	.42	.20	.41	.89	.32
tragen	'to carry'	.06	.17	.32	.48	1,00	.00
treten	'to kick'	.27	.45	.50	.51	.82	.39
trösten	'to comfort'	.00	.00	.23	.43	.93	.26
wählen	'to select'	.28	.46	.28	.46	.50	.52
ziehen	'to pull'	.16	.37	.17	.38	.70	.47
	Group mean	**.16**		**.26**		**.81**	
Non-biasing	*ärgern*	'to annoy'	.50	.51	.36	.49	.82	.40
	bemalen	'to daub/paint'	.39	.50	.42	.50	.85	.36
	besuchen	'to visit'	.40	.50	.18	.39	.94	.25
	drücken	'to hug'	.57	.50	.20	.41	.84	.37
	filmen	'to film'	.33	.48	.23	.43	.86	.36
	fragen	'to ask'	.46	.51	.10	.31	.79	.42
	kitzeln	'to tickle'	.47	.51	.13	.34	.69	.47
	küssen	'to kiss'	.65	.49	.44	.51	.85	.36
	malen	'to paint'	.52	.51	.41	.50	.80	.41
	nerven	'to bother'	.48	.51	.09	.29	.77	.43
	piken	'to prick'	.32	.47	.27	.45	.80	.41
	prüfen	'to examine'	.40	.50	.28	.46	.64	.49
	quälen	'to torture'	.35	.49	.19	.40	.92	.27
	reizen	'to provoke'	.47	.51	.06	.25	.65	.49
	rufen	'to call'	.58	.50	.05	.23	.76	.44
	schlagen	'to beat'	.35	.49	.52	.51	.76	.44
	streicheln	'to stroke'	.50	.51	.14	.36	.76	.44
	suchen	'to search'	.68	.48	.60	.50	.97	.18
	überraschen	'to surprise'	.33	.48	.17	.38	.87	.34
	verstecken	'to hide'	.36	.49	.32	.48	.93	.25
	Group mean	**.46**		**.26**		**.81**		
Verbs excluded	holen	'to pick up/ to send for'	.53	.51	.29	.46	1.00	.00
	warnen	'to warn'	.35	.47	.00	.00	.79	.42

*Note*s: *M* mean value of subject choice, SD standard deviation.

We computed a generalized linear mixed model with a logit link function fit by maximum likelihood to predict the probability of subject continuation in additive and adversative contexts. We set up random factors for Participants and Verb. As fixed factors we included Connective (and, but), IC type (subject-, object- and non-biasing verb type) and their interaction. We also added the gender of the subject in the stimulus clause as contextually given information and its interaction with connective. We found significant effects of the random factors participant ($z = 6.46, p < .001$) and verb ($z = 3.31, p = .001$) showing a substantial interpersonal variability and verb-related differences. The effect of IC bias was non-significant ($F = .39, p = .679$). There was a significant main effect of the factor Connective ($F = 407.77, p < .001$). The probability of subject continuation in the *and*-condition was significantly higher than in the *but*-condition ($\beta = 2.967, t = 15.46, p < .001$). As illustrated in Figure 1, responses elicited in the

additive condition showed a strong association with subject continuation (M = .79), and therefore differed significantly from the response pattern in the adversative condition (M = .25).
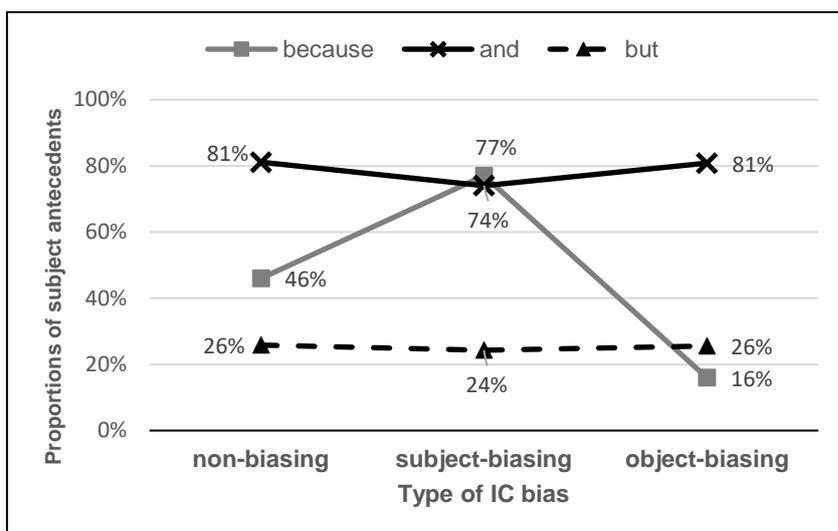

Figure 1: Proportions of subject reference in causal, additive and adversative sentences

These robust associations were not affected by the factor IC bias, as the non-significant interaction of connective by IC bias shows (F = 1.42, p = .242). Similarly, the referential effects of the connectives were not influenced by the gender of the subject referent since the main effect of gender and the interaction of gender by connective were non-significant.

2.3 Discussion

Comparisons between the IC values for some of the verbs established in our sample with those available in other sources showed similar estimates. Differences in the allocation of individual verbs to types of IC-types might be due to individual variation or task effects. While some studies explicitly required identification of a causally responsible referent, our task only required a spontaneous meaningful sentence continuation. In this respect, we obtained a broader range of responses. As mentioned above, there were three response types with different distributions in the individual verb samples. Some predicates such as *kitzeln* ('to tickle'), *baden* ('to bathe'), *necken* ('to tease'), or *reizen* ('to provoke') elicited continuations that exclusively explained the event at hand with reference to one of the protagonists. Other verbs such as *küssen* ('kiss') also elicited continuations, in which the referents were equally involved, e.g., … *because they love each other*. The response pattern of the most verbs featured some responses that allocated causation to situational properties or introduced new referents. In our sample, we identified two verbs which evoked the representation of events that were most frequently explained by situation features such as time, e.g., *holen* ('to pick up') …*because it is already dark*, or location, e.g., *warnen* ('to warn') … *because there is black ice on the road*. Although peripheral to our investigation, these findings highlighted an important aspect of causal attribution, namely that participants are likely to evaluate action decisions of protagonists based on a holistic appraisal of the represented situation model. Apparently, the representation of events evoked by interpersonal verbs in *because*-contexts did not narrow down the discourse perspective on causation and responsibility attributions to the main protagonists only, but appeared to activate a broader spectrum of conceptual knowledge underlying the lexical meaning of verbs.

The causality biases of the German action verbs investigated the first study were not clearly affected by the gender information provided in the sentential context. Although there was a

tendency for higher causal attribution to male referents, we failed to replicate the findings of Ferstl, Garnham, and Manouilidou (2011). This might be due to language specific effects or to the size and composition of the verb sample. Apart from these obvious differences, the status of gender information needs to be taken into account more thoroughly. Ferstl, Garnham, and Manouilidou (2011) and previous studies (LaFrance, Brownell, and Hahn, 1997; Mannetti and De Grada, 1991) found a specific interaction between the gender of referents and the psychological valence of verbs. They reported that male referents were more likely to be selected as instigators of negative actions, while positive verbs were biased towards object continuations regardless of gender. These findings raise the question whether contextually provided gender information activates access to prototypical male and female participants as represented in the conceptual structure of specific types of interpersonal activities. Verbs denoting physical actions should exhibit stronger gender effects due to richer, experience-based representation of situational knowledge. This assumption is in line with the abstraction cline proposed in Lexical Category Model (Semin, 2009; Semin and Fiedler, 1991) and with the psycholinguistic framework of situated cognition (Barsalou, 2008; Wu and Barsalou, 2009). We address issue of gender as an element of the situational knowledge underlying the meaning of action verbs in the second study.

In this line of thought, the present study explored if causality patterns presumably anchored in the conceptual structure of some interpersonal verbs exhibit similar effects on the referential choices in the context of causal, additive and adversative connectives. Our results showed that the IC type of the verb, did not affect the referential choices in additive or adversative sentences. In additive contexts marked by the German connective *und* ('and'), participants showed a consistent preference for maintaining reference to the subject antecedent (79%). With similar consistency, they selected the object antecedent (75%) in sentence continuations introduced by the German adversative connective *aber* ('but'). In sum, our investigation provided evidence, that the presence of an additive and an adversative connective in the sentential context guided referential strategies toward reference maintenance or shift, respectively. This result is in line with experimental investigation of the way Dutch and Russian additive and adversative connective influence expectations of referential coherence in upcoming discourse (Koornneef and Sanders, 2013; Mak, Tribushinina, and Andreiushina, 2013).

Considering their consistent effects in terms of referential maintenance or shift, we could conceive of *und* ('and') and *aber* ('but') as a subject-biasing and an object-biasing connective, respectively. Still, there was no synergistic endorsement between the referential effects of connectives and implicit causality biases which could be expected when subject-biasing verbs were used in *and*-sentences, or when object-biasing verbs were used in *but*-sentences. The categories of subject-, object-, and non-biasing predicates were clearly discernible only in sentences containing the causal connective. We interpret this finding as evidence for our second hypothesis. Apparently, the construal of a causal coherence relation, which focuses attention on the cause of an action, activated causal information represented in the meaning of verbs. In the reduced context of the stimuli used in the present study, the additive and adversative relations marked by overt connectives took priority over the implicit causality patterns of verbs.

3 Experimental Study 2 – Effects of conceptual knowledge on the construal of IC biases

Cognitive linguistics treats situational knowledge and thus social information as an integral part of the linguistic meaning (Langacker, 1999). The conceptual structure underlying the meaning of content lexical items consist of three main knowledge types: taxonomic, situational and affective knowledge. Situational knowledge elements comprise information about prototypical

events: locations, time, causal relations, participants and their social roles, properties and actions (Santos, et al., 2011, Wu and Barsalou 2009). The representation of prototypical participants and their relations in the conceptual structure of verbs evolves through experiences subsuming multimodal perceptual information, affective appraisals, patterns of action responses and corresponding sociocultural evaluations.

Study 2 aimed at exploring conceptual knowledge elements that might influence the representation of causal relations in events denoted by the agentive verbs assessed in Study 1. In terms of situational knowledge, we investigated the notions of affectedness (physical impact of an action on the affected protagonist) and social acceptability of interpersonal actions. As pointed above, affectedness has been discussed as a conceptual notion underlying the representation of semantic roles such as Patient or Theme in the abstract semantic structure of verbs (Levin and Rappaport Hovav, 2005). Based on theoretical assumptions from social psychology and cognitive linguistics (Barsalou, 2008; Langacker, 1999; Malle, 2011; Semin, 2009), we considered evaluations in terms of pro-social behavior to be an element in the conceptual structure of interpersonal actions that is distinct from psychological valence. Therefore, we conducted a study to obtain estimates of social acceptability and affectedness for the German interpersonal action verbs in our sample.

Further, we explored the issue of gender information as a possible interface between syntactically provided contextual and conceptual information. More precisely, we addressed the questions, whether gender information can be considered a property of prototypical participants in specific types of interpersonal activities, and whether it becomes activated in mixed gender causal contexts (cf. Section 2.1.2 Design and procedure in Study 1).

With respect to affective knowledge elements, the research on IC biases has taken into account only the valence dimension that pertains to appraisals of the intrinsic pleasantness of events and entities. Physiological arousal is a basic affective dimension (Russell, 2003) which contributes to the perception of emotional intensity and action tendencies. To obtain a more comprehensive picture of the part affective knowledge plays in the construal of causality biases, we targeted the effects of valence and arousal. Values of the affective dimensions of the verbs were taken from the Berlin Affective Word List (BAWL-R) (Võ, et al. 2009).

By examining the selected factors and their interactions, we sought to provide a more detailed picture of the contributions the different types of conceptual knowledge provide to support the representation of causality patterns in German action verbs.

3.1 Method

3.1.1 Participants

Thirty university students (21 females) participated in the study in partial fulfilment of course requirements. The mean age of the sample was 24 years, ranging from 19 to 32. All participants reported to be native speakers of German.

3.1.2 Design and procedure

We used a pen and paper questionnaire to obtain estimates for the conceptual features of physical affectedness and conformity to social norms in the fifty verbs under scrutiny in Study 1. We used stimuli of the type *'Person A feeds person B'* which syntactically qualified person A as the initiator of the event denoted by the verb, leaving gender information

unspecified. We asked participants to estimate the extent to which an activity carried out by person A physically affected person B on a 7-level Likert scale from 1 (not at all) to 7 (fully). By the same procedure, participants estimated the compatibility of the action expressed by the verb with culturally established norms of social behavior. We used four lists, counterbalanced for task and pseudorandomized for order of presentation of the verbal stimuli. The stimuli were presented in lists containing twenty-five verbs for each of the two tasks. There were four lists with randomized order of stimulus presentation and counterbalanced for order of presentation of the two tasks.

3.2 Results

To obtain estimates for physical affectedness and compatibility to social norms of the actions denoted by the verbs under scrutiny we computed a generalized linear mixed model with an identity link for each of the two variables. The data exhibited normal distribution. The model contained Participants as a random factor. As fixed factors we included Verb, Gender of participants (male, female), and their interaction.

The model estimating degrees of affectedness revealed a significant random effect of Participants ($z = 3.14$, $p = .002$) indicating substantial interpersonal differences. We found a main effect of Verb ($F = 11.95$, $p < .001$) but no effect of Participants' gender ($F = .04$, $p = .839$). There was a significant interaction of Verb by Gender ($F = 2.98$, $p < .001$), since men and women produced different affectedness ratings for some of the verbs. The ratings for the verb *schützen* ('to protect') exemplify this finding. Men ($M = 6.29$) but not women ($M = 3.90$) associated the action of protecting someone with a strong physical effect on the protected person.

Concerning the estimates for social norms, the model yielded similar results. There was a significant random effect of Participants ($z = 3.13$, $p = .002$). We found a main effect of Verb ($F = 8.88$, $p < .001$) but no effect of Participants' gender ($F = 1.96$, $p = .162$). There was a significant interaction of Verb by Gender ($F = 1.95$, $p < .001$), since men and women differed in their ratings for some of the verbs. For instance, the process denoted by the verb *fesseln* ('to tie up/to enthrall') received higher ratings of social acceptability from the male participants ($M = 5.00$) than from the female ones ($M = 2.43$). For both variables, we attribute the gender related differences pertaining to some of the verbs to the concurrent activation of concrete and abstract meanings in the given non-restrictive contexts.

Descriptive statistics of the estimates per verb are given in Table 2. Additionally, we obtained ratings for the affective values of valence and arousal from the Berlin Affective Word List (BAWL-R) (Võ, et al. 2009).

Table 2: Ratings for physical affectedness, compliance to social norms, valence and arousal

Verb type	Verb		Affectedness		Social norms		Valence	Arousal
			M	*SD*	*M*	*SD*	*M*	*M*
Subject-biasing	*begrüßen*	'to welcome'	3.29	1.92	6.39	1.47		
	berühren	'to touch'	5.75	1.35	5.11	1.50	1.79	2.89
	grüßen	'to greet'	2.74	1.91	6.39	1.45	1.20	2.04
	langweilen	'to bore'	2,61	1.66	3.86	1.58		
	necken	'to tease'	4.36	1.64	3.89	1.60	.60	2.84
	stören	'to disturb'	3.75	1.86	3.21	1.99	-1.65	3.43
Object-biasing	*baden*	'to bathe'	5.89	1.52	4.39	1.57	1.11	2.59
	beißen	'to bite'	5.07	2.60	3.19	2.60	-2.10	4.23

erwischen	'to detect'	4.00	1.59	3.71	1.50		
fangen	'to catch'	5.43	1.40	3.75	1.51	-.53	2.96
fesseln	'to tie up'	4.93	2.26	3.71	2.40	-1.38	3.53
füttern	'to feed'	5.50	1.40	4.96	1.53	.59	2.35
hauen	'to strike/hit'	6.29	1.68	2.25	2.03	-1.19	3.90
heben	'to lift'	5.14	1.69	4.14	1.76	0.01	2.14
jagen	'to chase'	5.29	1.82	2.71	1.41	-.59	3.61
kämmen	'to comb'	5.43	1.29	4.57	1.50		
kneifen	'to pinch'	5.11	1.99	3.43	2.17	-.15	3.50
lieben	'to love'	4.61	2.13	5.36	1.68	2.72	3.67
loben	'to praise'	3.82	2.37	4.93	1.94	1.80	2.25
pflegen	'to care'	5.32	1.59	5.61	1.20	0.94	2.67
schaukeln	'to rock'	5.25	1.38	4.25	1.58		
schieben	'to push'	5.89	1.29	3.93	1.84	-.65	3.19
schubsen	'to shove'	6.14	1.46	2.64	2.02	-2.00	4.29
schütteln	'to shake'	6.07	1.56	2.96	1.50	-.53	3.21
schützen	'to protect'	4.50	2.06	5.14	1.65	1.47	2.47
tragen	'to carry'	5.79	1.52	4.96	1.53	.12	1.89
treten	'to kick'	4.89	2.64	3.18	2.57	-1.12	2.63
trösten	'to comfort'	4.18	1.57	6.04	1.80	1.38	2.36
wählen	'to choose'	3.07	2.04	3.68	1.95	.06	2.63
ziehen	'to pull'	5.00	1.56	4.07	1.98	-.29	1.84
Non-biasing *ärgern*	'to annoy'	3.89	1.50	3.00	2.02	-1.22	3.75
bemalen	'to daub/paint'	5.04	1.88	3.96	1.93		
besuchen	'to visit'	3.71	1.80	5.68	1.54	1.44	2.76
drücken	'to hug'	6.11	1.26	5.14	1.30	2.10[1]	2.73
filmen	'to film'	3.04	1.48	3.57	1.53	.70	2.50
fragen	'to ask'	2.71	1.63	5.48	1.70	.68	2.38
kitzeln	'to tickle'	6.32	1.28	4.36	1.42	1.17	3.65
küssen	'to kiss'	6.32	1.25	5.82	1.36	2.67	3.37
malen	'to paint'	2.75	1.80	4.32	1.39	1.34	2.00
nerven	'to bother'	3.82	1.70	3.07	1.80	-1.28	3.77
piken	'to prick'	5.96	1.55	3.11	1.77	-1.05	2.54
prüfen	'to examine'	3.68	1.66	4.00	1.57	-1.90	3.80
quälen	'to torture'	4.54	2.62	2.49	1.46	-3.00	3.19
reizen	'to provoke'	4.00	1.87	3.50	1.80	-.40	3.80
rufen	'to call'	4.18	2.29	4.39	2.04	.09	2.68
schlagen	'to beat'	5.14	2.55	2.76	1.63	-1.91	3.94
streicheln	'to stroke'	6.18	1.02	4.75	1.51	2.78	2.32
suchen	'to look for'	1.86	1.30	5.04	1.32	-.06	2.76
überraschen	'to surprise'	3.57	1.62	5.11	1.57	1.59	3.95
verstecken	'to hide'	4.79	1.69	3.18	1.36	-.43	2.62

Notes. Affectedness – appraisals of the physical impact of the action on the affected referent on a scale from 1 (not

[1] This valence value of the verb *drücken* (-.18) given in BAWL-R leads us to assume diverging interpretations of the verb in our questionnaire and in the BAWL-R. Our participants consistently understood the verb *drücken* to denote hugging, which can be reasonably appraised as a pleasant activity. The negative valence value obtained from BAWL-R seems indicative of an interpretation of the verb *drücken* in the sense of pressing or squeezing. Therefore, we used the affective values for the unambiguous verb *umarmen* ('to hug/to embrace').

at all) to 7 (fully); *Social norms* – appraisals of the acceptability of interpersonal actions according to norms of social behavior rated on a scale from 1(not at all) to 7 (fully); *Valence* – affective appraisal of an eliciting event in terms of its intrinsic pleasantness, rated on a scale from -3 (very negative) to +3 (very positive); *Arousal* – physiological activation, rated on a scale from 1 (low) to 5 (high); *Valence* and *arousal* values obtained from BAWL-R list (Võ, et al., 2009).

The ratings of physical affectedness indicated that participants considered not only degrees of physical contact and exerted force but also movement and physiological effects of emotional states. Psychological Stimulus-Experiencer verbs, which allow a contextually motivated agentive interpretation, showed degrees of affectedness around the scale mean, e.g., *überraschen* ('to surprise', *M* = 3.57) or *reizen* ('to provoke', *M* = 4.00).

The estimates for the correspondence between actions and norms of social behavior discern two semantic fields – acts of aggression and activities in the field of care and social cooperation. Between those poles we found heterogeneous actions like *filmen* ('to film') or *bemalen* ('to daub/to paint'), which show ambiguity between fun and mischief. Actions such as *rufen* ('to call/to summon so.') or *prüfen* ('to examine') also received neutral ratings for their compatibility with social norms. The estimates for physical affectedness were weakly negatively correlated with the estimates for social conduct (ρ = -.072, *p* = .004). Social acceptability and valence were positively correlated (ρ = -.821, *p* < .004). Inspection of the individual verbs revealed a dissociation between valence and social acceptability in the expected direction, specifically for verbs denoting highly pro-social but for the agent not always entirely pleasant activities like *trösten* ('to comfort') or *füttern* ('to feed').

To address collinearity issues, we regressed the four variables on each other applying collinearity diagnostics. In all variants, the diagnostics revealed only low to moderate variance inflation factors (VIF $\leq$ 3.3) that were below the cut-off values of 5 or 10 suggested as a rule of thumb in the literature (Johnston, 1984; O'Brien, 2010).

In order to explore the effects of situational and affective knowledge elements on the construal of causal attributions to the subject referents (subject vs. object re-mention as dependent variable), we ran generalized mixed models with a logistic link function fit by maximum likelihood. We set up random factors for Participant and Verb. As fixed effects, we entered Physical affectedness, Social norms, Valence, Arousal (all centered), Gender of the subject referent as a categorical predictors with female gender as a reference category, and all two-way interactions. By backward elimination supported by AIC values, we fitted a model, which included Affectedness, its two-way interactions with Arousal and Valence, and the interaction of Arousal by Gender. Table 3 gives an overview of the model including the estimated beta coefficients of the predictors.

Table 3: Parameter estimates of the regression model: Causal attributions to the subject referent in the whole verb sample, *N* = 44

ID	Predictor	Regression coefficient B	SE	t	df	p	Exp(B)
1	Affectedness	-.435	.13	-3.27	1	.001	.65
2	Affectedness by Arousal	.500	.17	2.98	1	.003	1.65
3	Affectedness by Valence	.370	.11	3.30	1	.001	1.45
4	Arousal by Gender (m)	.614	.20	2.86	1	.004	1.85
	Intercept	-.839	.58	-.53	1	.569	.48

Notes. ID - number of predictors

Increasing levels of physical affectedness were associated with lower probability of causal attribution the subject referent. The interaction of the factor affectedness with the affective factors valence and arousal showed that highly arousing or positive actions with lower degrees of affectedness were more likely to be attributed to the subject referent. The interaction of

arousal by gender showed that in highly arousing actions men were more likely to receive the causal attribution. The rates of male ($M = .25$) and female ($M = .08$) referents in the subject continuations elicited by the object-biasing verb *hauen* ('to hit') illustrate the effect. There were significant random effects for Participants ($z = 2.21$, $p = .027$) and Verbs ($z = 3.29$, $p = .001$). Notwithstanding the individual and verb-based variation, the analyses indicated that the preference for causal attribution to the affected referent is modulated by the affective features. The interaction of arousal and gender information showed that gender might be involved in the representation of prototypical agents stored the conceptual structure of some action verbs.

Next, we addressed the question whether some of the conceptual knowledge types might specifically affect the distribution of causal attributions to the subject or to the object referent in the subsample of non-biasing verbs. We ran generalized mixed models with a logistic link function fit by maximum likelihood. We set up random factors for Participants and Verbs. As fixed effects, we entered Affectedness, Social norms, Valence, Arousal (all centered), Gender of the subject referent as categorical predictors, and all two-way interactions. By backward elimination supported by AIC values, we fitted a model, which included Social norms ($\beta = .215$, $p = .021$, exp(B) = 1.27) and the interaction of Affectedness by Valence ($\beta = .159$, $p = .004$, exp(B) = 1.17) as positive predictors of subject continuation. The interaction of Arousal by Gender(f) revealed a significantly lower probability of causal attribution to female subjects in highly arousing actions ($\beta = -.688$, $p = .002$, exp(B) = .50). There was a significant random effect of Participants ($z = 2.13$, $p = .033$), but not of Verbs.

To reveal the underlying structures in the group of non-biasing verbs we entered the standardized values of subject choice, affectedness, social norms, valence and arousal of the individual verbs as variables in a hierarchical cluster analysis. Based on the Euclidean distances as a similarity measure, we clustered the verbs using between-groups linkage. The results are represented in Figure 2.
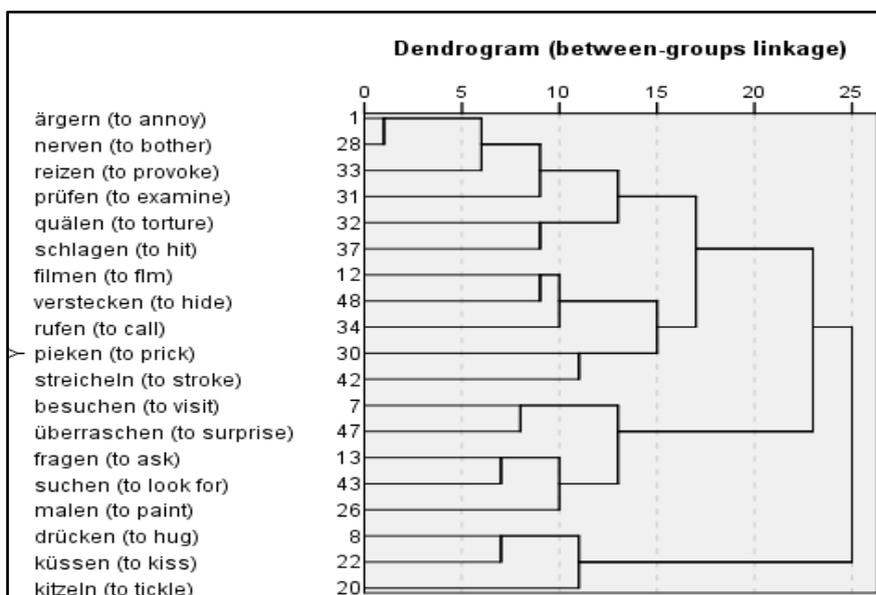

Figure 2: Hierarchical cluster of the non-biasing verbs

The dendrogram revealed three main clusters which arranged the verbs on a continuum between socially less and highly acceptable actions. The first cluster comprised two sub-clusters, differentiated by the interaction of affectedness and valence. The first sub-cluster contained negative highly arousing actions pertaining to the semantic field of aggression. Their order reflected a decreasing probability of causal attribution to the subject that correlated with

increasing physical impact on the object referent, (c.f. *ärgern* 'to annoy', *M* = .50 and *schlagen* 'to beat', *M* = .35). The second sub-cluster comprised neutral to positive actions with low to medium degrees of affectedness. The linkage between those verbs reflected an increasing probability of causal attribution to the subject.

The second main cluster comprised verbs denoting pro-social activities such as visiting, looking for or surprising other persons. These activities were characterised by low degrees of physical affectedness and neutral to positive valence. The third main cluster contained socially acceptable, highly positive actions associated with higher probability for subject-based explanations. This cluster illustrated the interaction of affectedness as a predictor of causal attributions to the referent.

3.3 Discussion

Our results presented evidence for the effect of situational knowledge elements such as physical affectedness and compliance to norms of social behavior on the probability of causal attributions to the subject or the object referent (Beavers, 2011; Malle, 2011). Higher degrees of physical affectedness of the object referent supported the construal of explanations, which motivate the event at hand by properties and actions of the affected referent. Still, the effect of affectedness was modulated by the affective properties of action verbs. Actions perceived to be more arousing were more likely to be explained with reference to the subject than actions with lower arousal. Physiological arousal is an affective dimension that characterizes physiological processes and states of the actor. Appraisals of high arousal appear to draw attention to the actors, thus increasing the probability to explain the event at hand with reference to the actor's disposition and goals.

With respect to psychological valence, we partially replicated results of previous studies (Ferstl, Garnham, and Manouilidou, 2011; Franco and Arcuri, 1990; Mannetti and De Grada, 1991), which found that negative actions exhibit a higher probability of subject reference. Due to our focus on action verbs and to the inclusion of the factor physical affectedness in our design, we obtained a more differentiated picture of the motivational inferences induced by positive and negative valence appraisals and their interplay with arousal. Investigations of the relation between arousal and valence showed that the relation of these affective dimensions corresponds to a non-symmetric quadratic function. Emotionally valenced terms, be they strongly positive or strongly negative exhibit high arousal values (for a discussion of this cross-linguistically stable finding, see Võ, et al., 2009).

Negative highly arousing actions involving a strong physical impact on the affected referent like *beißen* ('to bite', *M* = .29), or *schubsen* ('to shove', *M* = .28) were more likely to be attributed to the subject as compared to positive actions of moderate arousal like *füttern* ('to feed', *M* = .03), or *pflegen* ('to care/to pamper', *M* = .10). In contrast to the strong object bias of positive actions with high degrees of affectedness, positive appraisals of actions with low to moderate degrees of affectedness like *grüßen* ('to greet', *M* = .70) or *besuchen* ('to visit', *M* = .40) elicited more explanations concerning activities or properties of subject referent.

In the group of non-biasing verbs, we found that the IC-biases were associated with the appraisals of actions for their compatibility with norms of social behavior. Higher ratings of social behavior correlated with higher rates of subject choice. Besides the interaction between affectedness and valence also found to influence referential biases in the whole verb sample, compatibility with social norms turned out to be another factor specifically explaining causal attribution in the sub-sample of non-biasing verbs. As our sample comprised a relatively small

number of non-biasing interpersonal verbs, the variability of their causal attributions and the elements of conceptual knowledge found to affect it so far clearly await further investigation.

Starting from the assumption that preferences for reference continuation or shift are a discourse-based phenomenon, we investigated the effect of gender information provided by the immediate syntactic context of the stimulus clauses. There was no significant main effect of gender. Within the additive, adversative and causal samples of sentence continuation, male and female subject protagonists were selected with comparable frequency. Gender was not a significant predictor of subject continuation in causal contexts. However, we found that it interacted significantly with arousal, predicting more causal attributions of highly arousing actions to male than to female subject referents. This effect was most pronounced in the semantic field of aggressive actions. Taking into account the relation between arousal and clearly valenced verb mentioned above we interpreted this finding as partly replicating the influence of gender information on the construal of causal attributions discussed in Ferstl, Garnham, and Manouilidou (2011). The authors found that causes of negative actions were attributed more frequently to male subjects. As Ferstl, Garnham, and Manouilidou (2011) did not investigate the influence of arousal, our findings contribute to a more precise delineation of the contribution of the main affective dimensions in the representation of verb meanings and to a better understanding of their interactions with information provided by the syntactic context.

An item analysis revealed effects of gender at the level of some individual predicates. We will illustrate this effect by means of the interpretation the verb *berühren* ('to touch') received in the context *Peter berührt Sonja* ('Peter touches Sonja')*. Although *berühren* ('to touch') as a polysemous verb might have been understood as an emotion term, there were no sentence continuations suggesting a psychological interpretation. Participants consistently represented the situation involving a male and a female referent in terms of physical contact. Stimuli with a masculine subject (*Peter*) always contextualized the meaning of *berühren* as caressing. In contrast, stimuli with a feminine subject (*Sonja*) also elicited responses in the verb pertained to a light tapping on the arm/shoulder of the male referent in order to his attention. Other instances of gender effects were found in the semantic fields of aggressive activities more frequently attributed to male actors as opposed to the semantic field of care activities more likely attributed to female actors.

The structure of stimulus clauses specified two persons as nominal antecedents. The narrow syntactic context seemed to influence the interpretation of polysemous psychological verbs. On an interpretation as psychological verbs, Stimulus-Experiencer verbs should show a clear preference for causal attribution to the Stimulus referent. Yet, the participants in our study appeared to interpret such verbs as denoting interpersonal activities. The effects of situational knowledge and affective dimensions seemed to override causation patterns prototypically associated with semantic roles in the representation of psychological verbs. Verbs like *ärgern* 'to annoy' or *überraschen* 'to surprise' did not exhibit the expected causal attribution to the stimulus referent occupying the subject position in the stimulus clause. Instead, they elicited explanations frequently based on activities and properties of the object referent (e.g., *because the object referent is poking fun at him; because it is the object referent's birthday*), thus representing the activity at hand as a response originating in social interaction.

Taken together, our findings revealed that participants utilized available conceptual and contextual information for the construal of their explanations. Motivation and causal attributions resulted from complex inferences guided by considerations of affectedness, affective dimensions and appraisals of actions in terms of social behavior.

4 Summary and conclusion

On reading the connector *because* participants "construct a causal connection between the previous event and the incoming event" (Zwaan and Radvansky, 1998, p. 171). This process involves activation of the conceptual structure of the event at hand which includes the representation of situational, introspective and taxonomic knowledge (Wu and Barsalou, 2009). Our findings concerning the probability of implicit causality inferences in the context of non-causal connectives supported the view of IC as a discourse level phenomenon that depends on the construal of overtly marked causal coherence relations (Pickering and Majid, 2007; Semin, 2009; Semin and Marsman, 1994; Stevenson, et al., 2000). In the specific context of interpersonal activities, the presence of causal connectives shapes expectations towards an explanation of social behavior. In this sense, the connective seems to draw attention to those properties of the represented situation model, which assist inferences about the motivation of a person to perform given action. Causal or motivational attribution to the actor or to the affected person increases their referential salience. Increased salience promotes expectations of reference maintenance or reference shift in upcoming discourse which we perceive as implicit causality biases (Featherstone and Sturt, 2010; Garrod, Freudenthal, and Boyle, 1994; McKoon, Green, and Ratcliff, 1993).

With respect to the role of conceptual knowledge in the construal of causal attributions in interpersonal actions, our experimental results revealed that high degrees of physical impact on the affected person reliably predicted reference to the object referent. This effect, however, was modulated not only by positive and negative valence appraisals, but also by physiological arousal, an affective dimension that has not been considered in IC investigations so far. In their explanations of highly arousing actions with strong physical effects participants more often referred to the subject than they did in explaining actions associated with moderate or low arousal. This effect was enhanced by negative valence. In contrast, positive valence increased probabilities of subject reference in actions with lower degrees of physical affectedness and low to moderate arousal. Further, we found interactions of conceptual features with gender information provided in the syntactic context. Very likely, the conceptual structure of activities involving strong physical impact and pronounced affective properties (e.g., in the semantic fields of care or aggression) also contain gender information about prototypical participants. Gender cues given by syntactic environment seem to enhance gender considerations during the construal of causal attributions. Such multifactorial interactions reveal that people consider intricate, non-orthogonal effects of conceptual features in order to make plausible judgments of observable interpersonal activities.

The present experimental investigation of factors underlying the construal of implicit causality biases in German verbs expressing interpersonal activities yielded results that support the view of implicit causality as an epiphenomenon of explicitly marked causal coherence relations. Motivational and causal inferences influencing referential cohesion appeared to be guided by complex considerations of affective properties and conceptual knowledge in terms of affectedness, gender and social acceptability of interpersonal actions.

References

Ariel, M. (2014). *Accessing noun-phrase antecedents*. New York: Routledge.

Arnold, J. (2001). The effect of thematic roles on pronoun use and frequency of reference continuation. *Discourse Processes*, *31*, 137-162.

Au, T. K. (1986). A verb is worth a thousand words: The causes and consequences of interpersonal events implicit in language. *Journal of Memory and Language*, *25*, 104-122.

Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology*, *59*(1), 617-645.

Beavers, J. (2011). On affectedness. *Natural Language and Linguistic Theory*, *29*, 335-370.

Bittner, D. and Kuehnast, M. (2012). Comprehension of intersentential pronouns in child German and child Bulgarian. *First Language*, *32*(1-2), 176-204. https://doi.org/10.1177/0142723711403074

Bosch, P., Katz, G., and Umbach, C. (2007). The non-subject bias of German demonstrative pronouns. In M. Schwarz-Friesel, M. Consten, and M. Knees (Eds.), *Anaphors in text: Cognitive, formal and applied approaches to anaphoric reference* (pp. 145-164). Amsterdam: Benjamins.

Bott, O. and Solstad, T. (2014). From verbs to discourse: a novel account of implicit causality. In B. Hemforth, B. Mertins, and C. Fabricius-Hansen (Eds.), *Psycholinguistic approaches to meaning and understanding across languages* (pp. 219-251). Cham: Springer.

Brown, R. and Fish, D. (1983). The psychological causality implicit in language. *Cognition*, *14*(3), 237-273.

Carramazza, A., Grober, E., and Garvey, C. (1977). Comprehension of anaphoric pronouns. *Journal of Verbal Learning and Verbal Behavior*, *16*, 601-609.

Corrigan, R. (1993). Causal attributions to states and events described by different classes of verbs. *British Journal of Social Psychology*, *32*(4), 335-348. https://doi.org/10.1111/j.2044-8309.1993.tb01004.x

Croft, W. (2009). Aspectual and causal structure in event representation. In V. C. Mueller Gathercole (Ed.), *Routes to language: Studies in honor of Melissa Bowerman* (pp. 139-166). New York: Psychological Press.

Ehrlich, K. (1980). Comprehension of pronouns. *Quarterly Journal of Experimental Psychology*, *32*(2), 247-255. https://doi.org/10.1080/14640748008401161

Featherstone, C. R. and Sturt, P. (2010). Because there was a cause for concern: an investigation into a word-specific prediction account of the implicit causality effect. *Quarterly Journal of Experimental Psychology*, *63*(1), 3-15. https://doi.org/10.1080/17470210903134344

Ferstl, E., Garnham, A., and Manouilidou, C. (2011). Implicit causality bias in English: A corpus of 300 verbs. *Behavior Research Methods*, *43*,124-135.

Fillmore, C. J. (1970). The grammar of *hitting* and *breaking*. In R. Jacobs and P. S. Rosenbaum (Eds.), *Readings in English transformational grammar* (pp. 120-133). Waltham: Ginn.

Franco, F. and Arcuri, L. (1990). Effect of semantic valence on implicit causality of verbs. *British Journal of Social Psychology*, *29*(2), 161-170.

Garrod, S., Freudenthal, D., and Boyle, E. (1994). The role of different types of anaphor in the on-line resolution of sentences in a discourse. *Journal of Memory and Language*, *33*(1), 39-68. https://doi.org/10.1006/jmla.1994.1003

Garvey, C. and Caramazza, A. (1974). Implicit causality in verbs. *Linguistic Inquiry*, *5*, 459-464.

Garvey, C., Caramazza, A., and Yates, J. (1974). Factors influencing assignment of pronoun antecedents. *Cognition*, *3*, 227-243.

Goikoetxea, E., Pascual, G., and Acha, J. (2008). Normative study of the implicit causality of 100 interpersonal verbs in Spanish. *Behavior Research Methods*, *40*(3), 760-772. https://doi.org/10.3758/BRM.40.3.760

Graesser, A. C., Millis, K. N., and Zwaan, R. A. (1997). Discourse comprehension. *Annual Review of Psychology*, *48*, 163-189.

Green, S. B. and McKoon, G. (1995). Telling something we can't know: Experimental approaches to verbs exhibiting implicit causality. *Psychological Science*, *6*(5), 262-270.

Hartshorne, J. K. (2014). What is implicit causality? *Language, Cognition and Neuroscience*, *29*(7), 804-824. https://doi.org/10.1080/01690965.2013.796396

Hartshorne, J. K., O'Donnell, T. J., and Tenenbaum, J. B. (2015). The causes and consequences explicit in verbs. *Language, Cognition and Neuroscience*, *30*(6), 716-734. https://doi.org/10.1080/23273798.2015.1008524

Hartshorne, J. K., Sudo, Y., and Uruwashi, M. (2013). Are implicit causality pronoun resolution biases consistent across languages and cultures? *Experimental Psychology*, *60*(3), 179-96. https://doi.org/10.1027/1618-3169/a000187

Jackendoff, R. (1990). *Semantic structures*. Cambridge: MIT Press.

Johnston, J. (1984). *Econometric Methods* (3rd ed.). New York: McGraw-Hill.

Kehler, A. (2002). *Coherence, reference, and the theory of grammar*. Stanford: CSLI Publications.

Kehler, A. (2004). Discourse topics, sentence topics, and coherence. *Theoretical Linguistics*, *30*, 227-240.

Kehler, A., Kertz, L., Rohde, H., and Elman, J. L. (2008). Coherence and coreference revisited. *Journal of Semantics*, *25*, 1-44.

Kintsch, W. (1998). *Comprehension: A paradigm for cognition*. New York: Cambridge University Press.

Knott, A. and T. J. M. Sanders. (1998). The classification of coherence relations and their linguistic markers: an exploration of two languages. *Journal of Pragmatics*, *30*, 135-175.

Koornneef, A. W. and Sanders, T. J. M. (2013). Establishing coherence relations in discourse: The influence of implicit causality and connectives on pronoun resolution. *Language and Cognitive Processes*, *28*, 1169-1206. https://doi.org/10.1080/01690965.2012.699076

Koornneef, A. W. and van Berkum, J. J. A. (2006). On the use of verb-based implicit causality in sentence comprehension: Evidence from self-paced reading and eye tracking. *Journal of Memory and Language*, *54*, 445-465.

Kuehnast, M., Roeper, T., and Bittner, D. (2009). What is the acquisition path of topic shift? In S.L. Devi, A. Branco, and R. Mitkov (Eds.), *Proceedings of the 7th discourse anaphora and anaphora resolution colloquium (DAARC 2009)* (pp. 37-47). Chennai: AU-KBC Research Centre.

Kuehnast, M. and Valcheva, E. (2012). Implicit verb causality as a discourse cue in German. In S. Massalova (Ed.), *Proceedings of the 3ʳᵈ International Conference 'Contemporary cognitive research' [Когнитивные исследования на современном этапе. Материалы Третьей Международной научно-практической конференции 29-30.03.2012]* (pp. 104-109). Rostov-on-Don: Southern Federal University.

Kuehnast, M., Wassiliwizky, E., Wagner, V., Jacobsen, T., and Menninghaus, W. (2014). Being moved: Linguistic representation and conceptual structure. *Frontiers in Psychology: Emotion Science*, 5:1242. https://doi.org/10.3389/fpsyg.2014.01242

LaFrance, M., Brownell, H., and Hahn, E. (1997). Interpersonal verbs, gender, and implicit causality. *Social Psychology Quarterly*, *60*, 138-152.

Langacker, R. W. (1999). *Grammar and conceptualization*. Berlin: De Gruyter Mouton.

Levin, B. (1993). *English verb classes and alternations: A preliminary investigation*. Chicago: University of Chicago Press.

Levin, B. and Rappaport Hovav, M. (2005). *Argument realization*. Cambridge: Cambridge University Press.

Mak, W. M. and Sanders, T. J. M. (2010). Incremental discourse processing: How coherence relations influence the resolution of pronouns. In M. Everaert, T. Lentz, H. de Mulder, Ø. Nilsen, and A. Zondervan (Eds.), *The linguistics enterprise: From knowledge of language to knowledge in linguistics* (pp. 167-182). Amsterdam: Benjamins.

Mak, W. M., Tribushinina, E., and Andreiushina, E. (2013). Semantics of connectives guides referential expectations in discourse: An eye-tracking study of Dutch and Russian. *Discourse Processes*, *50*, 557-576.

Malle, B. F. (2011). Time to give up the dogmas of attribution: An alternative theory of behaviour explanation. *Advances of Experimental Social Psychology*, *44*, 297-352.

Mann, W. C. and Thompson, S. A. (1986). *Rhetorical structure theory: Description and construction of text structures*. Marina del Rey, CA: Information Sciences Institute.

Mann, W. C. and Thompson, S. A. (1988). Rhetorical structure theory. Toward a functional theory of text organization. *Text*, *8*, 243-281.

Mannetti, L. and De Grada, E. (1991). Interpersonal verbs: implicit causality of action verbs and contextual factors. *European Journal of Social Psychology*, *21*, 429-443.

McKoon, G., Green, S. B., and Ratcliff, R. (1993). Discourse models, pronoun resolution, and the implicit causality of verbs. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *19*, 1040-1052.

Morera, Y., De Vega, M., and Camacho, J. (2010). Differences in continuity of force dynamics and emotional valence in sentences with causal and adversative connectives. *Cognitive Linguistics*, *21*(3), 501-536. https://doi.org/10.1515/COGL.2010.017

Mulder, G. and Sanders, T. J. M. (2012). Causal coherence relations and levels of discourse representation. *Discourse Processes*, *49*(6), 501-522.

Nedjalkov, V. (ed.). (1988). *Typology of resultative constructions*. Amsterdam: John Benjamins.

O'Brien, R. M. (2010). A caution regarding rules of thumb for Variance Inflation Factors. *Quality & Quantity*, *41*(5), 673-690.

Pandelaere, M., Hoorens, V., and Peeters, G. (2003). Why ask about Peter? Do you think he caused it? How the description of causal events guides the selection of questions about them. *Basic and Applied Social Psychology*, *25*, 291-297.

Pander Maat, H. L. W. and Sanders, T. J. M. (2009). How grammatical and discourse factors may predict the forward prominence of referents: two corpus studies. *Linguistics*, *47*, 1273-1319.

Pickering, M. J. and Majid, A. (2007). What are implicit causality and implicit consequentiality? *Language and Cognitive Processes*, *22*, 780-788.

Rudolph, U. and Försterling, F. (1997). The psychological causality implicit in verbs: A review. *Psychological Bulletin*, *121*, 192-218.

Russell, J. A. (2003). Core affect and the psychological construction of emotion. *Psychological Review*, *110*, 145-172.

Sanders, T. J. M. and Noordman, L. (2000). The role of coherence relations and their linguistic markers in text processing. *Discourse Processes*, *29*, 37-60.

Sanders, T. J. M., Spooren, W., and Noordman, L. (1992). Toward a taxonomy of coherence relations. *Discourse Processes*, *15*, 1-35.

Sanders, T. J. M., Spooren, W., and Noordman, L. (1993). Coherence relations in a cognitive theory of discourse representation. *Cognitive Linguistics*, *4*, 93-133.

Santos, A., Chaigneau, S. E., Simmons, W. K., and Barsalou, L. W. (2011). Property generation reflects word association and situated simulation. *Language and Cognition*, *3*(1), 83-119.

Semin, G. R. (2009). Language and social cognition. In F. Strack and J. Förster (Eds.), *Social cognition – the basis of human interaction* (pp. 269-290). Psychology Press.

Semin, G. R. and 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. https://doi.org/10.1037/0022-3514.54.4.558

Semin, G. R. and Fiedler, K. (1991). The linguistic category model, its bases, applications and range. *European Review of Social Psychology*, *2*(1), 1-30.

Semin, G. R. and Marsman, G. (1994). On the information mediated by interpersonal verbs: event precipitation, dispositional inference and implicit causality. *Journal of Personality and Social Psychology*, *67*(5), 836-849.

Stevenson, R., Knott, A., Oberlander, J., and McDonald, S. (2000). Interpreting pronouns and connectives: Interactions among focusing, thematic roles and coherence relations. *Language and Cognitive Processes*, *15*(3), 225-262.

Verhoeven, E. (2010). Agentivity and stativity in experiencer verbs: Implications for a typology of verb classes. *Linguistic Typology,* *14*(2-3), 213-251. https://doi.org/10.1515/lity.2010.009

Võ, M., Conrad, M., Kuchinke, L., Urton, K., Hofmann, M., and Jacobs, A. M. (2009). The Berlin affective word list reloaded (BAWL–R). *Behavior Research Methods*, *41*(2), 534-538. https://doi.org/10.3758/BRM.41.2.534

Wu, L. -L. and Barsalou, L. W. (2009). Perceptual simulation in conceptual combination: Evidence from property generation. *Acta Psychologica*, *132*(2), 173-189. https://doi.org/10.1016/j.actpsy.2009.02.002

Zwaan, R. A., Magliano, J. P., and Graesser, A. C. (1995). Dimensions of situation model
    construction in narrative comprehension. *Journal of Experimental Psychology: Learning,
    Memory, and Cognition*, *21*(2), 386-397.

Zwaan, R. A. and Radvansky, G. (1998). Situation models in language comprehension and
    memory. *Psychological Bulletin*, *123*(2), 162-185.

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