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Three Principles of Explanation

Verb Schemas, Balance, and Imbalance Repair

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Two studies demonstrated that explanations of interpersonal events are governed by the principles of implicit verb causality and balance. In addition, the data indicate that subjectively imbalanced interpersonal events (e.g., John admires Jack because he is so arrogant) elicit processes designed to achieve imbalance repair. In contrast to previous studies, we analyzed subjective (rather than objective) balance and imbalance as well as the cognitive processes mediating the repair of subjectively imbalanced situations. The results suggest that repair mechanisms implied by perceived imbalance vary consistently for different kinds of verbs. Moreover, imbalance repair results in highly systematic attributions to different persons or specific interactions between the persons involved, in line with predictions derived from Kelley's covariation principle. Additional analyses of perceived covariation information provided evidence that these repair mechanisms are mediated by reevaluations of covariation information implicit in the meaning of the verbs used to describe the interpersonal event.

Keywords: *implicit verb causality; covariation; attribution; balance*

Now let me explain why this makes intuitive sense.

—Mark Twain

Consider the following two examples of interpersonal events, both involving a stimulus person (S) eliciting an emotional state and an experiencer (E), experiencing the emotional state elicited by the stimulus:

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1. John (S) surprises Jack (E).
2. Mary (E) admires Jean (S).

How do we explain events such as these? Brown and Van Kleeck (1989) proposed that explanations of interpersonal experiences such as these conform to three principles.

The first principle is called implicit causality and refers to linguistic features of the verb used to describe an event: Explanations will typically refer to the stimulus person (John in Example 1, Jean in Example 2), whose behaviour gives rise to the subjective state of the experiencer (Jack in Example 1, Mary in Example 2). There is a vast literature on the implicit causality in verbs, referring to the phenomenon that different kinds of verbs used to describe interpersonal events give rise to different assumptions about the causes of the described events (for an overview, see Rudolph & Försterling, 1997a).

The second principle used for explaining an interpersonal event is cognitive balance, a mechanism first postulated by Fritz Heider (1946, 1958). According to this principle, a positive event (effect) is typically attributed to a positive cause, and a negative event (effect) is typically attributed to a negative cause. Examples for balanced events are "John hates Jack [negative effect] because he is so arrogant [negative cause]," or "Mary admires Jean [positive effect] because she is so nice [positive cause]." In contrast, negative causes for positive effects (e.g., "Mary admires Jean because she is so arrogant") or positive causes for negative effects (e.g., "John hates Jack because he is so nice") appear to be unbalanced. According to Heider (1946, 1958), unbalanced cause-effect combinations are perceived as unsatisfactory and unstable and thus typically elicit cognitive change.

In taking up Heider's (1946, 1958) considerations, Brown and Van Kleeck (1989) postulated a third principle called "imbalance repair" (see also Rudolph & von Hecker, 1997). That is, unbalanced cause-effect relationships require supplementary statements (i.e., additional explanations). According to this principle, it is postulated that the need for such supplementary statements covaries with the original imbalance of the to-be-explained cause-effect relationship: The higher the imbalance, the higher the need for an additional explanation.

To provide an everyday example, consider the following fictitious conversation between two students (a variant of an example given by Brown & Van Kleeck, 1989):

Jack: Well, John admires Mary because he is so arrogant.
Bill: What do you mean—he admires her because *he* is . . .? I'd think that you would tell me something about Mary—a feature of *her* that causes *his* admiration . . .?
Jack: Sorry, my mistake—John admires Mary because *she* is so arrogant.
Bill: I am still puzzled—what is so great about being arrogant?
Jack: Well, you know how shy he is; he thinks he could use a bit of arrogance, too.

The first principle (implicit verb causality) is illustrated here because if we hear about someone admiring another person, we assume that the cause for the admiration lies in the stimulus (i.e., the person who is being admired), not the person who

experiences admiration. The second principle (cognitive balance) is illustrated by the fact that Bill is puzzled by the fact that a normally negative feature (arrogance) causes a positive effect (admiration). And finally, the third principle (imbalance repair) is illustrated by Jack's final answer: The unbalanced cause-effect relationship is explained by supplementary statements. Typically, as Brown and Van Kleeck (1989) noted, the principle of imbalance repair is used by pointing out that there is something special about the experiencer (John's shyness).

Brown and Van Kleeck (1989) provided good evidence that these three principles of explanation (a) are present not only in artificial scenarios provided by experimenters but also in recollections of real-life events and (b) "contribute a great deal to defining satisfactory explanations" (p. 590).

In this study, we took these original observations for granted and went one step further: Specifically, we investigated which underlying cognitive mechanisms mediate these three kinds of explanations. We hypothesized that the most common repair strategy (Principle 3) consists of a subjective redefinition of implicit covariation information (Kelley, 1967, 1972) inherent in the interpersonal verb used to describe an interpersonal event. We analyzed the relationships between balance, verb causality, and perceived covariation by restricting ourselves to the use of scenario techniques, allowing us to assess ratings (Study 1) as well as response latencies (Study 2) for balanced versus unbalanced explanations of interpersonal events. That is, we provide a connection between classic attribution variables (i.e., covariation information *sensu* Kelley, 1967; Kelley & Michela, 1980) designed to explain the implicit causality effect on one hand and the principles of balance and imbalance repair on the other hand.

Study 1 explored the effects of balance versus imbalance in interpersonal events on attributions and perceived covariation. The results shed light on the cognitive processes used when applying the principles of verb causality, balance, and imbalance repair. Study 2 analyzed the relationships between varying degrees of imbalance and imbalance repair in more detail. Before turning to these two studies, however, we must take a closer look at the relationship between causal judgments concerning interpersonal events and covariation information.

Covariation Information as a Mediator Between Descriptions and Explanations of Interpersonal Events

Brown and Fish (1983) as well as Rudolph and Försterling (1997a), on the basis of a comprehensive reanalysis of available data, concluded that different kinds of interpersonal verbs are systematically related to Kelley's (1967, 1972) covariation information. It is assumed that covariation information (*consensus* and *distinctiveness*) is an implicit part of the verb schema, thus mediating between the (linguistic) description of an interpersonal event and its explanation. Indeed, a number of studies that required participants to rate consensus and distinctiveness for different kinds

of interpersonal verbs revealed that interpersonal verbs are associated with corresponding patterns of perceived consensus and distinctiveness (e.g., Brown & Fish, 1983; Hoffman & Tchir, 1990; McArthur, 1972; Rudolph, 1997; Schuster, Rudolph, & Försterling, 1998).

According to these findings, stimulus-experiencer (SE) verbs such as *fascinate* or *bore* give rise to attributions to the sentence subject. At the same time, SE verbs are associated with perceptions of low consensus and low distinctiveness. For example, in the case of an SE verb such as *to fascinate*, we may implicitly assume that only few persons are likely to be fascinating (low consensus), whereas many persons can be fascinated (low distinctiveness), an information pattern that according to Kelley's (1967) covariation principle gives rise to attributions to the sentence subject (a "person attribution" in Kelley's terms). In contrast, experiencer-stimulus (ES) verbs such as *admire* or *distrust* are associated with perceptions of high consensus and high distinctiveness, which lead to attributions to the sentence object (the entity) according to Kelley's covariation principle. For example, for an ES verb such as *to admire*, we may implicitly know that only few persons are likely to be admired (high distinctiveness) and that many people are likely to admire (high consensus), an information pattern that is compatible with attributions to the sentence object (an "entity attribution" in Kelley's terms). Thus, the perceived pattern of covariation information for interpersonal actions and states fits the causal inferences perfectly well.

This explanation of implicit causality has been labelled the "covariation hypothesis" (Rudolph & Försterling, 1997a). The question that guided the present research was: Assuming that the covariation hypothesis is correct (and the available evidence strongly suggests that this is the case), how does the perception and processing of different kinds of interpersonal events map into the three principles of explanation proposed by Brown and Van Kleeck (1989)? It was the aim of Study 1 to analyze this relationship by assessing ratings of balance, attributions, and covariation information for balanced versus unbalanced interpersonal events.

Study 1: Interpersonal Events, Balance, Covariations, and Attribution

In line with Brown and Fish (1983) and Rudolph and Försterling (1997a), we assume that covariation information is an integral part of the meaning of interpersonal verbs. This information is processed when hearing or reading descriptions of interpersonal events and is thereby responsible for the first principle postulated by Brown and Van Kleeck (1989), that is, the verb causality effect.

Now what happens in the case of unbalanced interpersonal events, that is, when the second principle of cognitive balance is violated? From the research of Brown and Van Kleeck (1989), it is clear that then imbalance repair takes place. However, we know little about the cognitive mechanisms mediating imbalance repair, except

that the degree of imbalance repair is proportional to the amount of imbalance in the perceived interpersonal event (Brown & Van Kleeck, 1989).

A promising starting point for investigating the cognitive processes that are responsible for imbalance repair is the assumption that this repair strategy, from the point of view of the naive perceiver, requires a subjective redefinition of perceived covariation information. To illustrate, let us consider an example.

Stage 1: "John admires Mary." It has been shown that, all else being equal, the verb *to admire* is typically characterized by high consensus and high distinctiveness: Many people admire, and few people are admired. This information pattern perfectly fits the typical attribution associated with the verb: an attribution to the sentence object or, in Kelley's (1967) terms, to the entity.

Stage 2: "John admires Mary because she is so arrogant." Now the principle of balance is violated because the explanation of a positive interpersonal event (i.e., to admire) refers to a negative cause (i.e., being arrogant). This state of affairs (cognitive imbalance) causes the need for imbalance repair, that is, supplementary explanations for this kind of interpersonal event.

Stage 3: The imbalance of the perceived interpersonal event (admiring someone because of a negative trait of the admired person) is highly incompatible with the covariation information implicit in the meaning of the verb: For balanced events, it is certainly true that almost everyone admires someone else (consensus) and that only few people are the targets of admiration (distinctiveness). However, for unbalanced events, a reversal of perceived covariation should take place: (a) Few people feel admiration vis-à-vis negative traits or behaviours of others (low consensus rather than high consensus); (2) this person (shy John) will feel admiration concerning all kinds of arrogant people (low distinctiveness rather than high distinctiveness).

Stage 4: "There must be something special to John that causes him to admire arrogant people." To summarize, if John admires Mary for being arrogant (imbalanced event), then this event is more telling about John rather than Mary. That is, the standard attribution suggested by the interpersonal event is now being reversed.

In sum, we assume that the process of imbalance repair requires a rethinking of the implicit covariation pattern responsible for the standard verb causality effect that is present in balanced interpersonal events. Accordingly, this rethinking process elicited by imbalance should lead to attributions that represent a reversal of the "normal" attributions to be found in balanced scenarios.

In Study 1, we examined these considerations by manipulating (a) verb type (SE vs. ES verbs), (b) the valence of the observed effect (positive vs. negative verb valence), and (c) the valence of the explanation (a positive vs. a negative trait).[1] Note that the resulting combinations of verb valence (positive and negative) and valence of explanations (positive and negative) result in two kinds of balanced scenarios (positive effects with positive explanations and negative effects with negative explanations) and two kinds of unbalanced scenarios (positive effects with negative explanations and negative effects with positive explanations).

Hypotheses

We developed opposing hypotheses for balanced and unbalanced interpersonal events. To start with balanced events, and in line with previous findings, we hypothesized that stimulus attributions would emerge for both kinds of verbs (i.e., to sentence subjects for SE verbs and to sentence objects for ES verbs). In addition, for these balanced scenarios, low consensus and low distinctiveness should be found for SE verbs, and high consensus and high distinctiveness should be found for ES verbs.

In unbalanced scenarios, however, we assumed that the reverse pattern of results would be found: We expect that experiencer attributions would be obtained (i.e., to sentence objects for SE verbs and to sentence subjects for ES verbs). Moreover, for these unbalanced scenarios, high consensus and high distinctiveness should be found for SE verbs, and low consensus and low distinctiveness should be found for ES verbs.

Table 1 summarizes this experimental design and the resulting hypotheses for attributions and covariation information (i.e., consensus and distinctiveness).

Method

Participants. Fifty-seven students from the University of Potsdam (43 women) enrolled in introductory psychology and educational sciences courses participated in the experiment. Their ages ranged from 20 to 39 years ($M = 24$ years). They received credit for experimental time or, alternatively, a payment of DM 15 (approximately $9). Sessions were run in small laboratory groups of 1 to 3 participants, using written instructions and additional practice trials provided on a PC. Sessions lasted approximately 45 minutes.

Materials. Twenty-four different interpersonal verbs were used to construct the scenarios (see the Appendix). The verbs were selected using the category system provided by Rudolph and Försterling (1997a). Among the 24 verbs, 6 were positive SE verbs (e.g., *encourage*, *fascinate*), 6 were negative SE verbs (e.g., *bore*, *irritate*), 6 were positive ES verbs (e.g., *admire*, *trust*), and 6 were negative ES verbs (e.g., *despise*, *fear*). For all of these verbs, pilot studies had shown that the degree of perceived positive or negative valence was the same across all four category-valence combinations. All scenarios were constructed by presenting a main clause "A [verb] B" and a subordinate clause "because X is such a [friendly vs. unfriendly] person." For the subordinate clause, the terms *friendly* and *unfriendly* were used to create balanced versus unbalanced triads. *X* was replaced by *A* for SE verbs and by *B* for ES verbs.[2]

As dependent variables, participants made four types of judgments for each scenario: attribution, consensus, distinctiveness, and balance. The latter judgment was used as a manipulation check for perceived balance. The item format always consisted of an incomplete statement that had to be completed by one of two response alternatives.

Table 1
Experimental Design and Stimulus Materials in Study 1

Verb Category	Verb Valence	Valence of Explanation	Example Scenario	Balance Condition	Expected Response Pattern		
					Attribution to Person A or B	Consensus	Distinctiveness
Stimulus-Experiencer	+	+	A encourages B because A is such a friendly person.	Balanced	A	Low	Low
	+	–	A encourages B, because A is such an unfriendly person.	Unbalanced	B	High	High
	–	+	A bores B because A is such a friendly person.	Unbalanced	B	High	High
	–	–	A bores B because A is such an unfriendly person.	Balanced	A	Low	Low
Experiencer-Stimulus	+	+	A admires B because B is such a friendly person.	Balanced	B	High	High
	+	–	A admires B because B is such an unfriendly person.	Unbalanced	A	Low	Low
	–	+	A despises B because B is such a friendly person.	Unbalanced	A	Low	Low
	–	–	A despises B because B is such an unfriendly person.	Balanced	B	High	High

As an illustration, consider a balanced scenario using an SE verb: "A encourages B because A is such a friendly person." The four-item formats read as follows: (a) attribution: "The person responsible for this event is [A vs. B]"; (b) consensus: "Other people encourage B as well [likely vs. unlikely]"; (c) distinctiveness: "A encourages other people as well [likely vs. unlikely]"; and (d) balance: "Does this situation make immediate sense to you [yes vs. no]?" During practice trials (see below), example scenarios were used with verbs that were not classified as either SE or ES verbs.

Experimental design. To minimize error variance due to task switching, all judgments of a given type were grouped into homogeneous judgment blocks. These four blocks were presented in a random sequence for each participant. Within each block, scenarios were constructed by combining all 24 verbs with explanations of both positive and negative valence, for a total of 48 scenarios per block. Thus, within each block, three within-subjects variables were manipulated with two levels each: verb category (SE vs. ES), verb valence (positive vs. negative), and type of explanation (positive vs. negative). Each cell in this design comprised six replications. Positive-positive and negative-negative levels of verb valence and type of explanation constituted the set of balanced scenarios; positive-negative and negative-positive combinations of verb valence and type of explanation constituted the set of unbalanced triads (see also Table 1). Within each block, all 48 scenarios were presented in a random sequence.

Procedure. Participants were first given an instruction sheet that explained the overall structure of the scenarios. They were told that they were to judge a series of interpersonal situations between two persons, A and B. These same letters would refer to the persons in all scenarios. Person A would always behave toward or feel about Person B in a certain way, and there would always be one additional piece of information that was related to an explanation of the event. It was made clear that participants were to judge the whole series of events repeatedly, according to different aspects or criteria, and that this would be done in a separate experimental block for each aspect. Moreover, it was stressed that there were no correct or incorrect answers but rather that the only concern of importance was the participants' own impressions about the interpersonal situation at hand. Participants were also asked to judge each scenario independently from one another.

Participants then proceeded to the computer, and the experiment was started. At the beginning of each judgment block, there was a practice sequence consisting of five practice scenarios to make participants familiar with the type of judgment in that particular block. Participants had to make their responses by using the marked left and right arrow keys of the computer keyboard. The meanings of these keys were specific for each block and were clarified by corresponding answering cues on the screen. After finishing all five judgment blocks, participants were debriefed, and the session was terminated.

Results

A general comment concerning the chosen strategy of data analysis is warranted. Given our experimental design, one way would be to analyze the eight condition means by means of $2 \times 2 \times 2$ three-factorial analyses of variance (ANOVAs) with the factors verb category, verb valence, and type of explanation. We used this strategy, although it had some serious disadvantages in our case. Adopting this strategy, we had to examine each of our core hypotheses about the shift in attribution, or the reversal of consensus and distinctiveness patterns, by testing three-way interactions among all these factors. On the other hand, all main effects and most two-way interactions (typically not significant) are meaningless, or at least difficult to interpret, because these effects were not addressed by our theory.

To circumvent this type of redundancy as produced by conventional full ANOVA reports, we decided to directly test the specific contrasts that corresponded to our hypotheses (for an illustration and recommendation of the contrast methodology, see Rosenthal, Rosnow, & Rubin, 2000). The general procedure is to calculate the mean square for a contrast by multiplying the eight condition means with appropriately chosen contrast weights and to test this mean square against the mean variance within conditions (see Rosenthal et al., 2000, p. 130). Note that both kinds of analyses, ANOVA and testing specified contrasts, yielded completely corresponding results. For the sake of simplicity and because of space restrictions, we report the specified contrast approach here; the corresponding results from the ANOVA procedure are available on request.

Manipulation check: perceived balance. To analyze whether our participants, as expected, viewed the combinations of verb valence and type of explanation as balanced and unbalanced, respectively, we formulated a contrast for the balance ratings that compared all conditions with congruent verb and explanation valences (SE-verb/positive/positive, SE-verb/negative/negative, ES-verb/positive/positive, ES-verb/negative/negative) with all conditions in which the valences were incongruent (SE-verb/positive/negative, SE-verb/negative/positive, ES-verb/positive/negative, ES-verb/negative/positive). This contrast was found to be significant, $F(1, 57) = 791.08$, $p < .001$, $d = 1.54$. The mean rating was 0.141 for balanced scenarios and 0.742 for unbalanced scenarios (the "balanced" end of the scale was 0, and the "unbalanced" end of the scale was 1). Thus, we observed strong evidence that the balance manipulation of the scenarios had been successful.

Attributions. We hypothesized that for balanced scenarios, participants would make attributions according to implicit verb causality (Principle 1): Participants should regard Person A (the sentence subject and stimulus) as responsible for the event in cases of SE verbs and Person B (the sentence object and stimulus) in cases of ES verbs. In contrast, this pattern should be reversed for unbalanced scenarios.

Table 2
Attribution and Covariation Judgments in Study 1

	Stimulus-Experiencer Verbs		Experiencer-Stimulus Verbs	
Explanation Valence	Positive	Negative	Positive	Negative
Attributions				
Positive	.11	.55	.77	.36
Negative	.54	.22	.32	.71
Consensus				
Positive	.22	.34	.06	.74
Negative	.58	.41	.91	.23
Distinctiveness				
Positive	.03	.70	.20	.23
Negative	.80	.16	.50	.40

To test these assumptions, we calculated an attribution score for the six judgments pertaining to the six verbs in each design cell by coding an attribution to A as 0 and an attribution to B as 1. These judgment scores were then summed and averaged across the six verbs. Thus, the calculated scores varied between 0 and 1.

The contrast relevant to this hypothesis was designed in the following way: For SE verbs, negative weights (hypothesized "A" ratings) were assigned to the two conditions with (a) positive verb valence and positive explanation and (b) negative verb valence and negative explanation. In contrast, positive weights were assigned to the two incongruent verb valence-explanation combinations (hypothesized "B" ratings, with [a] positive verb valence and negative explanation and [b] negative verb valence an positive explanation). For ES verbs, these assignments were exactly reversed. The overall contrast, across all eight conditions, proved significant, $F(1, 448) = 160.51$, $p < .001$, $d = 0.98$.

The respective means are provided in Table 2. Specifically, for SE verbs, participants attributed balanced combinations to Person A and unbalanced combinations to Person B. The reverse pattern of data was obtained for ES verbs: Balanced combinations were attributed to B and unbalanced combinations to A. Thus, we found the predicted reversal in attributions whenever scenarios presented an unbalanced cause-effect relationship.

Covariation judgments. Shifts in consensus and distinctiveness perceptions were expected in line with the attribution reversals described above (see Table 2). That is, the implicit covariation pattern typically associated with a verb of a given category should be observed when this verb was part of a balanced scenario and should be reversed when it was part of an unbalanced scenario. As with attribution judgments, the 0 and 1 responses were averaged across all six verbs of a given design

cell, yielding a score within a range of 0 and 1, with 0 = high and 1 = low for consensus and 0 = low and 1 = high for distinctiveness.

For consensus, negative weights (high hypothesized consensus) were assigned to the unbalanced SE verb conditions and to the balanced ES verb conditions, whereas positive weights (low hypothesized consensus) were assigned to the balanced SE verb conditions and to the unbalanced ES verb conditions, $F(1, 448) = 119.71$, $p < .001$, $d = 0.72$. However, as can be seen in Table 2, the hypothesized pattern of means described above did emerge in sufficient clarity only for ES verbs, but only to a much lesser extent for SE verbs. Thus, the expected reversal of consensus perceptions as a function of balanced versus unbalanced scenarios was strongly supported for ES verbs but only partially supported for SE verbs.

Upon inspection of the data in Table 2, we calculated an alternative contrast in which all conditions were assigned weights for low consensus except the two balanced ES verb conditions, thus modelling the observed partial shift, that is, a consensus reversal for ES verbs but not for SE verbs. This contrast was significant as well, $F(1, 448) = 186.09$, $p < .001$, $d = 1.04$. To test a possible increase in data fit from our original hypothesis contrast to the new revised contrast, we calculated a difference contrast between these two. The weights for a difference contrast were obtained by subtracting corresponding standardized weights between the two original contrasts. Each weight coefficient of an original contrast is standardized by dividing the individual weight by the standard deviation of all contrast weights (Rosenthal et al., 2000, p. 159). The test of this difference contrast showed a significantly improved data fit as provided by the second, revised contrast, which modelled the reversal of consensus only for ES verbs, $F(1, 56) = 70.06$, $p < .001$.

For distinctiveness, an analogous contrast analysis was conducted. Note that because of Kelley's (1967, 1972) terminology, our scoring procedure implies that values close to zero reflect low perceived distinctiveness. For SE verbs, weights were assigned in the following way: Balanced conditions received negative values (low ratings), whereas unbalanced conditions received high values (high ratings). The weights for ES verb conditions were exactly reversed. This contrast was again significant, $F(1, 448) = 152.86$, $p < .001$, $d = 0.82$. As Table 2 shows, SE verbs in both balanced conditions received lower distinctiveness judgments than the unbalanced conditions. Thus, for SE scenarios, the attribution shift was accompanied by a markedly reversed distinctiveness perception. As can be seen also from Table 2, however, the same reversal was obviously much weaker for ES verbs. Therefore, we used the same procedure as for consensus ratings; that is, we specified and tested a revised contrast, modelling an exclusive reversal of distinctiveness for SE verbs, but not ES verbs, with $F(1, 6) = 188.96$, $p < .001$, $d = 1.42$. Again, a difference contrast was calculated, but this time the increase in data fit, as observed in the higher F value, was not significant, $F(1, 448) = 2.45$, $p < .20$.

To summarize, when comparing consensus and distinctiveness judgments, there appears to be a mirror image. For SE verbs, the predicted sharp reversal in distinctiveness perception was obtained, whereas only a much smaller balance-related effect

emerged for consensus perceptions. In contrast, we observed a reversal of this data pattern for ES verbs: In this case, consensus perceptions varied with the balance state of the scenarios, and distinctiveness perceptions did so to a lesser extent.

Discussion

Principles 1 (verb causality) and 2 (cognitive balance) were strongly supported by our data (with at least large effect sizes according to Cohen, 1977): Principle 1 received support from the fact that strong verb causality effects were obtained with respect to attributions for balanced scenarios. Moreover, Principle 2 was confirmed by the fact the respective combinations of verb valence and valence of explanation, comprising balanced versus unbalanced cause-effect relationships, elicited highly corresponding judgments of balance by our participants.

What about Principle 3, the process of imbalance repair? According to our reasoning, covariation information has proved to be a promising candidate in explaining verb causality effects and thus might play a role in imbalance repair as well. Thus, we expected a reversal of attributions and perceived covariation (i.e., consensus and distinctiveness) for unbalanced cause-effect relationships. The data from the present experiment strongly support this reasoning, although not entirely in the way we expected. The picture seems very clear with respect to attributions: The expected reversal in attributions fits our expectations perfectly well and represents a very strong effect. The situation is more complex for covariation judgments, however. First of all and as expected, consensus and distinctiveness judgments are in line with the pattern predicted by implicit verb causality (Rudolph & Försterling, 1997a) for balanced scenarios. However, for unbalanced scenarios, the predicted reversal of perceived covariation was only observed for two of the predicted cases: (a) Consensus judgments changed from high to low in scenarios with ES verbs, and (b) distinctiveness judgments changed from low to high in scenarios with SE verbs.

In contrast to our expectations, however, consensus judgments in SE scenarios and distinctiveness judgments in ES scenarios did not change significantly in magnitude when the scenario was unbalanced, and contrasts modelling no change in those two cases yielded a (slightly or significant) better data fit. To gain a better understanding of these results, we try to provide an illustration of what happens here; the following considerations are summarized in Table 3.

Let us consider the situation for SE verbs first: “John fascinates Mary.” This event is typically characterized by perceptions of low consensus (few people are fascinating) and low distinctiveness (many people are fascinated by John), resulting in attributions to John (e.g., John is so wise and friendly). Now imbalance comes into play: “John fascinates Mary because he is so arrogant.” Principle 2 (cognitive balance) is violated, because a positive effect (fascination) is caused by a negative trait (arrogance). Hence, Principle 3 (imbalance repair) is needed.

We expected that perceptions of covariation would be reversed in this (unbalanced) case. Our participants proved us (at least partially) wrong: Rather, only distinctiveness

Table 3
Illustrative Example for Perceptions of Consensus, Distinctiveness, and Attributions in Balanced Versus Unbalanced Scenarios for Stimulus-Experiencer Versus Experiencer-Stimulus Verbs

Condition	Stimulus-Experiencer Verbs	Experiencer-Stimulus Verbs
Balance condition	John fascinates Mary because he is so wise.	John admires Mary because she is so wise.
Consensus	Low	High
Distinctiveness	Low	High
Attribution	John	Mary
Imbalance condition	John fascinates Mary because he is so arrogant.	John admires Mary because she is so arrogant.
Consensus	Low (unchanged)	Low (reversal)
Distinctiveness	High (reversal)	High (unchanged)
Attribution (according to the data in Study 1)	Mary	John
Attribution (according to Kelley's (1967, 1972) covariation principle)	Interaction between Mary and John	Interaction between Mary and John

perceptions were revised, whereas consensus remained unchanged. That is, the typical perceiver of this unbalanced cause-effect relationship infers that (a) John fascinates only few people (i.e., high instead of low distinctiveness), and (b) only few people fascinate Mary (i.e., consensus remains unchanged).

The opposite reversal-nonreversal pattern was found for ES verbs: "John admires Mary." This kind of event is typically connected with perceptions of high consensus (many people admire someone) and high distinctiveness (few people are admirable), resulting in attributions to Mary (e.g., Mary is so wise and friendly). When imbalance comes into play ("John admires Mary because she is so arrogant"), Principle 2 (cognitive balance) is violated again, because a positive effect (admiration) is caused by a negative trait (arrogance). In this case, according to our data, only consensus perceptions were revised, whereas distinctiveness remained unchanged. That is, the typical perceiver of this kind of unbalanced cause-effect relationship infers that (a) John admires few people (still high distinctiveness), and (b) few people admire Mary (low instead of high consensus).

As becomes clear now, the emerging picture is in fact extremely simple: All kinds of unbalanced scenarios result in perceptions of low consensus and high distinctiveness. Interestingly, according to Kelley's (1967, 1972) covariation principle, this information pattern is highly informative: This pattern of covariation indicates that a characteristic interaction between two people takes place. These assumptions were confirmed by McArthur (1972), who noted that attributions to an interaction between two persons (a person-stimulus interaction, in her words) are most frequent

under conditions of low consensus and high distinctiveness (for an overview and an extension of these considerations, see Försterling, 1989, 1992). Moreover, a similar prediction can be derived from Jaspars's (1983) concept of "interactive attributions." In other words, information about low consensus and high distinctiveness indicates attributions to an interaction between (in our example) John and Mary.

At this point of our research, we had ambivalent feelings: We were worried by the fact that our hypotheses were only partially supported, and we were impressed by the ingenious solution our participants provided for repairing perceived imbalance in interpersonal situations. Imbalance was resolved by revising the implicit information inherent in the meaning of a verb (consensus, distinctiveness) by changing it in a way that makes specific circumstances (i.e., a peculiar interaction between the persons involved) responsible for the obtained effect.

However, in the light of these considerations, one serious problem remained unsolved: If the perceived (revised) covariation information indicates that specific interactions between persons are responsible for unbalanced cause-effect relationships, why is it that we found almost perfect and strong reversals in attributions (i.e., attributions to the experiencer for unbalanced scenarios)? It was the aim of Study 2 to provide a solution for this seeming paradox.

Study 2

In Study 2, we (a) assessed interaction attributions, (b) varied the degree of balance versus imbalance of the described cause-effect relationships by using verbs with strong versus weak causal implications, and (c) assessed response latencies for the respective dependent variables. Let us consider these methodological characteristics in more detail.

Assessment of Interaction Attributions

Study 1 did not allow our participants to make attributions to interactions between the persons described in the interpersonal situations. This restriction may have contributed to the strong reversals in attributions in Study 1, and if participants had the possibility to choose interaction attributions, they might have done so (in accordance with the covariation pattern of low consensus and high distinctiveness obtained in Study 1). Thus, in Study 2, we introduced a new dependent variable enabling our participants to make interaction attributions.

Variation of Implicit Verb Causality

The logic underlying the inclusion of this variable is derived from the fact that implicit causality is by no means an all-or-none phenomenon (Rudolph, 1997;

Rudolph & Försterling, 1997b). We assume that the degree of imbalance repair is proportional to the strength of the implicit causality in interpersonal verbs. To explicate these assumptions, a closer look at the nature of implicit causality is needed.

The starting point of the argument is that some interpersonal verbs carry strong causal implications, whereas these causal inferences are comparatively weaker for other verbs. For example, Rudolph and Försterling (1997b) showed that studies of implicit verb causality have been biased toward using interpersonal verbs with especially strong causal implications. Although random selections of interpersonal verbs drawn from the total corpus of available verbs within a language still confirm the phenomenon of implicit verb causality, it is also evident that the obtained effects are clearly weaker for these random selections of verbs compared with the nonrandom (intuitive) selections of interpersonal verbs used by researchers in the field (Rudolph & Försterling, 1997b).

To illustrate, consider the example "John admires Mary" compared with "John trusts Mary" (both ES verbs). Rudolph (1997) found very strong attributions to the stimulus for *admire* (an effect size larger than $d = 0.80$ in terms of Cohen's [1977] index of effect sizes), whereas the corresponding values were significant, but much weaker, for *trust* (an effect size of about $d = 0.30$).

Thus, from the perspective of the naive perceiver, it seems absolutely clear to conclude that "admiration" is caused by the stimulus, whereas the same conclusion is less pronounced for "trust": Indeed, "trust" may be more common in interpersonal situations compared with "admiration"; therefore, it seems reasonable that in everyday life, there are more persons we trust than persons we admire. To further elaborate this argument, imagine that a person is not admirable; he or she may nevertheless be trustworthy. However, given that a person is not trustworthy, it seems comparatively less likely that he or she is nevertheless admirable.

As becomes evident from this example, *trust* and *admire* are probably characterized by different degrees of distinctiveness: The number of persons we trust is probably higher than the number of persons we admire. Rudolph (1997) demonstrated that indeed a clear correlation exists between the strength of the implicit causality of verbs and the patterns of covariation information associated with the verbs: The stronger the causality implicit in a verb, the stronger the associated degrees of consensus and distinctiveness, with correlations between covariation effects sizes and attribution effect sizes of about $r > .80$.

How does this phenomenon, which is called "strength of verb schema" in the remainder of this article, relate to the perception of balanced versus imbalanced interpersonal events? Our goal was to use verbs with different (i.e., strong vs. weak) degrees of implicit causality to manipulate the corresponding balance and imbalance of the scenarios we used. That is, for verbs with comparatively weaker causal implications, the resulting imbalance produced by providing an unbalanced explanation should be weaker compared with verbs with strong causal implications. A lower degree of imbalance, in turn, should lead to less pronounced imbalance repair mechanisms. Therefore,

the corresponding shifts in attributions and perceived covariation were hypothesized to be weaker for verbs with comparatively weaker causal implications.

The introduction of this variable has two advantages: (a) It allows an additional empirical test of the imbalance repair mechanisms observed in Study 1, and (b) it provides a direct test of Brown and Van Kleeck's (1989) assumption that the degree of imbalance repair is proportional to the imbalance that has been originally observed in an interpersonal cause-effect relationship.

Assessment of Response Latencies

According to our arguments presented thus far, we developed the following hypotheses concerning the temporal characteristics of the explanation of interpersonal events:

Hypothesis 1 (concerning Principle 1): Verbs with strong causal implications are characterized by extreme distributions of perceived consensus and distinctiveness and should thus require less cognitive effort compared with verbs with more intermediate distributions of consensus and distinctiveness. Hence, response latencies should be shorter for interpersonal events described by verbs with strong causal implications compared with verbs with weak causal implications.

Hypothesis 2 (concerning Principle 2): According to Heider's (1946, 1958) gestalt theory of phenomenal balance and causality in interpersonal relations, balance and imbalance are easily accessible features of interpersonal events. To use more recent terminology, the perception of balance versus imbalance should be based on schema-guided and highly automatic processes. Therefore, judgments about balance versus imbalance should be especially fast to make.

Hypothesis 3 (concerning Principle 3): Balanced interpersonal events are common and schema consistent compared with unbalanced events, which require imbalance repair mechanisms. Therefore, attributions should be especially fast for balanced compared with unbalanced interpersonal events.

Hypothesis 4 (concerning covariation information): The final prediction concerned the relation between response latencies for covariation information versus attributions. We hypothesized previously that the revision of perceived covariation is responsible for the imbalance repair (i.e., attribution reversal). Evidence that covariation judgments are more easily accessible than attributions has previously been presented by Schuster et al. (1998), yet not within the context of balanced versus imbalanced interpersonal events. Therefore, Study 2 explored the response time relations between perceived covariation versus attributions, and we expected shorter response latencies for covariation ratings compared with attribution ratings.

Method

Participants. Fifty-nine students from the Technical University of Chemnitz participated in the experiment. Their ages ranged from 19 to 42 years ($M = 25.2$ years).

Most were enrolled in introductory courses in psychology and educational sciences. Upon request, they received credit for experimental time or, alternatively, a payment of DM 15 (approximately $9). Sessions were run in small laboratory groups of 1 to 3 participants, using written instructions and further practice trials provided on a PC. Sessions lasted for approximately 45 minutes.

Materials. Thirty-two different interpersonal verbs were used (see the Appendix). Sixteen of them show especially strong verb causality effects, whereas the other 16 exhibit comparatively weaker verb causality effects (Rudolph & Försterling; 1997b). Thus, we manipulated the verb schema condition (strong vs. weak) by means of this manipulation. Within each group, half of the verbs were of positive and half were of negative valence; moreover, half of the verbs in each condition were SE verbs and half were ES verbs.

Dependent variables. Five judgments were made: (a) forced choice attributions (as in Study 1, "The person responsible for this event is [A vs. B]") and (b) interaction attributions, which tested the interactive component: "This event was most likely caused by [one of the two persons A or B vs. a special situation between them]"; (c) consensus, (d) distinctiveness, and (e) balance were assessed the same way as in Study 1.

Design and procedure. As in Study 1, all judgments of a given type were grouped into homogeneous judgment blocks. Four different verbs were used for each of the design combinations of verb category (SE vs. ES), strength of verb schema (high vs. low), and verb valence (positive vs. negative). To create balanced versus unbalanced conditions, two scenarios were constructed for each of the resulting total of 32 verbs, one with a positive and one with a negative explanation.

Response latencies. The computer program recorded response latencies for each dependent variable. Participants were asked to respond as quickly as possible. It was stressed that there were no correct or incorrect answers; rather, the only concern of importance was their own impressions about the interpersonal situations at hand. All other modalities concerning randomization, presentation, procedures, and practice trials were identical to those in Study 1.

Results

We computed contrast analyses in the same way as in Study 1, except that there were now 16 instead of 8 conditions, because each condition from Study 1 was replaced by 2 conditions, one for strong and one for weak verb schemas. As in Study 1, analogous analyses of variance were conducted, completely replicating the following contrast analyses (again, these ANOVA results are available on request).

Table 4
Balance Ratings for Verbs With Strong Versus Weak Causal Schemas by Verb Type, Verb Valence, and Explanation Valence in Study 2

	Stimulus-Experiencer Verbs		Experiencer-Stimulus Verbs	
Explanation Valence	Positive	Negative	Positive	Negative
Strong verb schema				
Positive	.03	.73	.07	.69
Negative	.93	.21	.92	.28
Weak verb schema				
Positive	.20	.67	.14	.49
Negative	.72	.31	.85	.40

Perceived balance. The contrast calculated as a manipulation check on perceived balance showed a significant effect, $F(1, 928) = 1{,}636.90$, $p < .001$, $d = 1.49$, indicating that, as in Study 1, participants viewed combinations of positive-positive and negative-negative verb-explanation valences as balanced (i.e., as "making immediate sense"), whereas positive-negative and negative-positive valence combinations were perceived as being unbalanced (see Table 4). Thus, the intended manipulation of cognitive balance states was successful. Specifically, contrasts were both significant when calculated separately for strong and weak verb schemas.

Forced choice attributions. First, we tested to what extent participants made attributions according to implicit verb causality in balanced scenarios and reversed those attributions in unbalanced scenarios and whether differences between strong versus weak verb schemas were obtained. Attribution scores were calculated from the four judgments pertaining to the four verbs in each design cell by coding an attribution to A as 0 and an attribution to B as 1. Contrast weights were assigned to model the hypothesized attribution reversals from A to B for balanced and unbalanced SE verb scenarios and the hypothesized attribution reversals from B to A for balanced and unbalanced ES verb scenarios. In this contrast, both verb schema conditions received identical weights, to test across both conditions. This overall pattern was highly significant, $F(1, 928) = 379.59$, $p < .001$, $d = 1.05$, as illustrated in Table 5. Thus, the results from Study 1 were completely replicated.

To test our hypothesis about different strengths of causal implication for weak versus strong verb schemas, the above contrast was calculated individually for each participant and for each level of verb schema strength (see Rosenthal et al., 2000). This contrast variable was then submitted to a within-group comparison between the two schema strength conditions, $t(58) = 6.26$, $p < .001$. That is, the absolute magnitude of the attribution reversal was more pronounced for strong verb schemas compared with weak verb schemas. Therefore, as predicted, the reversal of attributions turned out to be a function of the strength of the causal schema implicit in the verb.

Table 5
Forced Choice and Interaction Attributions for Verbs With Strong Versus Weak Causal Schemas by Verb Type, Verb Valence, and Explanation Valence in Study 2

	Stimulus-Experiencer Verbs		Experiencer-Stimulus Verbs	
Explanation Valence	Positive	Negative	Positive	Negative
Forced choice attributions				
Strong verb schema				
Positive	.10	.68	.76	.33
Negative	.63	.22	.18	.63
Weak verb schema				
Positive	.25	.56	.67	.37
Negative	.49	.25	.25	.56
Interaction attributions				
Strong verb schema				
Positive	.13	.69	.08	.60
Negative	.82	.24	.65	.31
Weak verb schema				
Positive	.26	.61	.20	.44
Negative	.67	.29	.68	.39

Interaction attributions. An additional score was derived by coding attributions to "one of the two persons A or B" as 0 and "a special situation between them" as 1. These scores were then averaged across the four verbs in each cell of the experimental design. The resulting score varied between 0 and 1 (for an overview, see Table 5). A contrast with assigned negative weights (A or B attribution) for all balanced scenario conditions and positive weights (interactive attribution) for all unbalanced scenarios was significant, $F(1, 928) = 549.73$, $p < .001$, $d = 1.17$. As illustrated in Table 5, unbalanced scenarios produced more interactive attributions than balanced ones, as expected. Again, an individual contrast score was calculated for each participant and each level of verb schema strength, which yielded no significant difference between those levels, $t(58) = .29$, *ns*.

Perceived covariation. First, consensus was examined, using the same scoring procedure as in Study 1. We directly tested the hypothesis of an asymmetric reversal, with consensus changing from high (balanced conditions) to low (unbalanced conditions) predominantly for ES verb scenarios but not for SE verb scenarios. For the pertaining contrast, conditions involving strong versus weak verb schemas were given the same assignments, thus testing across those levels. The contrast was significant, $F(1, 928) = 264.30$, $p < .001$, $d = 0.97$. Table 6 illustrates the data pattern. A comparison of individual contrast scores between the strong and the weak verb

Table 6
Consensus and Distinctiveness Ratings for Verbs With Strong Versus Weak Causal Schemas by Verb Type, Verb Valence, and Explanation Valence in Study 2

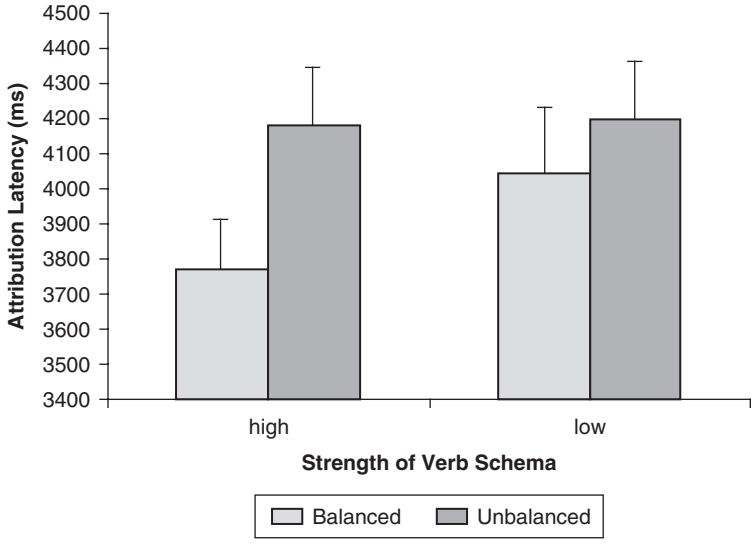
	Stimulus-Experiencer Verbs		Experiencer-Stimulus Verbs	
Explanation Valence	Positive	Negative	Positive	Negative
Consensus ratings				
Strong verb schema				
Positive	.39	.44	.07	.67
Negative	.63	.54	.90	.31
Weak verb schema				
Positive	.43	.42	.17	.56
Negative	.61	.53	.84	.45
Distinctiveness ratings				
Strong verb schema				
Positive	.07	.65	.33	.37
Negative	.79	.21	.48	.47
Weak verb schema				
Positive	.13	.60	.36	.29
Negative	.64	.24	.42	.47

schema conditions revealed that the asymmetric tendency for a consensus reversal in ES verb scenarios was more pronounced for strong verb schemas as opposed to weak verb schemas, $t(58) = 6.01$, $p < .001$.

For distinctiveness, the same analyses were performed (for an overview, see Table 6). The overall contrast testing the asymmetry of a distinctiveness reversal from low (balanced conditions) to high (unbalanced conditions) predominantly for SE verb scenarios and not for ES scenarios was found to be significant, $F(1, 928) = 233.39$, $p < .001$, $d = 0.97$. The analysis of individual contrast scores revealed that scenarios containing verbs with strong verb schemas showed a larger amount of asymmetric distinctiveness reversal than those containing verbs with weak verb schemas, $t(58) = 5.45$, $p < .001$.

Response latencies. First of all, the distributions of each latency variable across all within-participant conditions were examined. As expected, most of these variables were skewed to the right side of the distribution. For each within-subjects factor combination and for each participant, the latency score was calculated as the median across all relevant replications. For these measures, we obtained an acceptable overall fit to a normal distribution (none of the Kolmogoroff-Smirnoff z values exceeded .83; $p > .50$). Our analyses of response latencies were, however, backed up by parallel analyses on the natural-logarithm-transformed data (Fazio, 1990; Smith & Lerner, 1986). No differences were obtained for these two kinds of analyses.

Figure 1
Response Latencies for Attributions for Verbs With Strong Versus Weak Causal Schemas and for Balanced Versus Unbalanced Scenarios in Study 2



A further aim of Study 2 was to examine the time course of forced choice attributions as a function of the strength of the verb schema (Hypothesis 1). We assumed that the automatic component in the process of attribution mainly reflects the implicit verb schema. Such an automatic component should not be present (or to a significantly lesser degree) for verbs with weaker causal schemas; therefore, an elaborative thinking mode should be predominant even in the balanced case. We therefore compared forced choice attribution latencies by means of a 2 (verb categories: SE vs. ES) × 2 (strong vs. weak causal verb schema) × 2 (scenario balance: balanced vs. unbalanced) ANOVA. As can be seen from Figure 1, mean response latencies did not vary by the strength of the verb schema when scenarios were unbalanced ($M = 4{,}180$ ms for strong vs. $M = 4{,}197$ ms for weak verb schemas) but did so significantly when scenarios were balanced ($M = 3{,}770$ ms for strong vs. $M = 4{,}044$ ms for weak causal schemas), $F(1, 55) = 4.82$, $p < .05$. As post hoc test Newman-Keuls tests revealed, the condition "balanced and strong verb schema" was different at least at the $p < .001$ level from every other condition; no other significant differences emerged.

Hypothesis 2 stated that balance judgments should be made especially quickly. We observed significantly longer decision latencies for both kinds of attributions

than for balance judgments (balance vs. forced choice attribution, across both verb categories: M = 3,115 ms vs. M = 3940 ms, F[1, 51] = 49.33, $p < .001$; balance vs. interaction attribution, across both verb categories: M = 3,115 ms vs. M = 3,679 ms, F[1, 52 = 14.60, $p < .001$). These results confirm our assumption that assessments of balance are, compared with attribution and covariation judgments, easier to make and possibly a prerequisite to further causal reasoning.

Significant interactions between type of judgment, valence, and explanation showed that time for balance judgments did not vary as a function of scenario balance (balanced M = 3,117 ms, unbalanced M = 3,113 ms). In contrast, and in line with Hypothesis 3, attribution judgments required more time for unbalanced compared with balanced scenarios (forced choice attributions, balanced M = 3,804 ms, unbalanced M = 4,075 ms, across both verb categories, interaction with balance judgments, F[1, 51] = 7.75, $p < .01$; interaction attributions, balanced M = 3,597 ms, unbalanced M = 3,760 ms, across both verb categories, interaction with balance judgments, F[1, 52] = 9.65, $p < .005$). These results did not differ between verb categories.

Finally, contrary to Hypothesis 4, we found that across all conditions judgments about consensus (overall M = 4,721 ms) and distinctiveness (overall M = 4,694 ms) needed more time than both kinds of attribution judgments (forced choice attribution: for SE verbs, F[2, 100] = 20.74, $p < .001$; for ES verbs, F[2, 112] = 15.55, $p < .001$; interaction attribution: for SE verbs, F[2, 104] = 35.18, $p < .0001$; for ES verbs, F[2, 112] = 21.89, $p < .0001$). All post hoc comparisons using the Newman-Keuls procedure revealed significant differences between covariation and attribution latencies at least at the $p < .001$ level.[3]

Additional analyses for interaction attributions. Does imbalance lead to interaction attributions, as our results suggest thus far? In fact, it is possible to provide an additional test of this assumption. In Table 7, we provide the number of cases (across all participants and all trials in Study 2) in which either attributions to one interaction partner (A vs. B) or interaction attributions were made. We did so for those trials in which a reversal of covariation information was perceived by our participants versus those trials in which the covariation pattern implied by the verb schema was maintained. We obtained these values by counting the different types of co-occurrences between covariation (as implied by the verb schema versus reversed) and attributions (single vs. interaction attributions) within each participant and across all 32 unbalanced scenarios. Part A of Table 7 represents these frequencies for all cases and across all participants.[4]

Note that we examined only the covariation variable for which a reversed pattern was obtained in Studies 1 and 2, that is, distinctiveness for SE scenarios and consensus for ES scenarios. As a result, we were able to calculate how often we found (a) cases in which covariation reversal took place but no interactive attribution occurred (upper left cell); (b) cases in which perceived covariation remained congruent with the attribution suggested by the verb schema, while interactive attribution

Table 7
Contingency Table for Interaction Attributions in Study 2

	Interaction Attribution		
	Either A or B	Interaction	Σ
A. Covariation between interaction attributions and the reversal or nonreversal of perceived covariation			
Reversal of perceived covariation	379	641	1,020
Nonreversal of perceived covariation	291	573	864
Σ	670	1,214	1,884
B. Covariation between interaction attributions and the reversal or nonreversal of causal attribution			
Reversal of perceived forced choice attribution	388	842	1,230
Nonreversal of perceived forced choice attribution	282	373	655
Σ	670	1,215	1,885

was made (lower right cell); (c) cases in which the reversal of perceived covariation and interaction attribution occurred (upper right cell); and, finally, (d) cases in which neither of these mechanisms was applied at all (lower left cell).

A test of this 2 × 2 contingency table revealed a significant difference for the observed frequencies of the row margins ($\chi^2_1 = 6.45$, $p < .05$), showing that covariation reversal was more frequent for unbalanced scenarios compared with "normal" covariation implied by the verb schema. In addition, a significant difference was also obtained for the column margins ($\chi^2_1 = 78.53$, $p < .001$), demonstrating that interaction attributions were more frequent compared with single attributions. It is also evident from Table 7 that the most frequent imbalance repair consisted of covariation reversal in combination with interaction attribution ($n = 641$, i.e., 34% of all cases).

We also calculated analogous contingency tables for each participant separately, compared the individual chi-square values of the row effect with those of the column effect, and found that the effect size of the interactive attribution tendency was systematically and significantly stronger than the effect size of the tendency to reverse perceived covariation (Wilcoxon's $z = -2.05$, $p < .04$).

In a second analysis, we calculated a corresponding contingency table for the two attribution variables (see Part B of Table 7). We did so for those trials in which a reversal of forced choice attributions was perceived by our participants versus those trials in which the attribution implied by the verb schema was maintained. Again, we obtained these values by counting the different types of co-occurrences between forced choice attribution (as implied by the verb schema vs. reversed) and interaction attributions (single vs. interaction attributions) within each participant and across all 32 unbalanced scenarios.

Again, the fourfold contingency was highly significant ($\chi^2_1 = 88.05$, $p < .001$), indicating that the more likely one is to make an interactive attribution, the more likely one is to also perceive a reversal of attribution from A to B or vice versa. Again (and even more pronounced), the occurrence of attribution reversal and interaction attribution was by far the most frequent case ($n = 842$, i.e., 45%).

Taken together, it becomes evident from these contingency calculations that both covariation reversal (distinctiveness for SE verbs and consensus for ES verbs) as well as attribution reversal (effects we observed in both in Study 1 and 2) are systematically correlated with perceptions of interactive attributions. The covariation findings constitute additional evidence in support of our interpretation, that is, when unbalanced scenarios were perceived, participants tended to uniformly perceive low consensus and high distinctiveness as a pattern underlying interactive attributions (Jaspars, 1983).

Discussion

The three principles proposed by Brown and Van Kleeck (1989) were strongly supported by our studies. Moreover, the present research shed new light on the underlying processes mediating the perception of balanced versus unbalanced interpersonal events by including new dependent variables, that is, perceived covariation information (Studies 1 and 2), interaction attributions (Study 2), and response latencies (Study 2). In addition, we introduced different verbal schemas as independent variables in Study 2. The results can be summarized as follows:

1. For balanced interpersonal events, we predominantly found attributions to the person acting as a stimulus, as proposed by the causal schema of the verb. Moreover, these causal inferences were accompanied by analogous perceptions of covariation information (consensus and distinctiveness).
2. For unbalanced scenarios, we found pronounced attribution reversals (concerning forced choice attributions) and reversals of perceived consensus and distinctiveness. The reversals of perceived covariation, however, were mainly restricted to distinctiveness in the case of SE verbs and consensus in the case of ES verbs. The results of Study 2 confirmed this data pattern (thereby replicating the results of Study 1). Within this revision process that takes place vis-à-vis unbalanced interpersonal events, a covariation pattern of low consensus and high distinctiveness arises, which (according to Kelley, 1967, 1972) is highly informative concerning specific interactions between the two persons involved.
3. When looking at the interaction attributions of our participants, it becomes apparent that attributions to the specific interaction between the two persons involved were predominant for unbalanced scenarios (see Table 7). That is, we observed a strong correlation between (a) unbalanced interpersonal events, (b) covariation pattern revisions toward low consensus and high distinctiveness, and (c) interaction attributions.

4. These data patterns were consistently more pronounced for verbs (events) with strong (compared with weak) causal implications. Stronger causal implications of the verb used to describe an interpersonal event elicit stronger perceptions of imbalance (see Table 4), a more pronounced reversal in forced choice attributions and a higher frequency of interaction attributions (see Table 5), and, finally, a stronger reversal in distinctiveness perceptions for SE and consensus perception for ES verbs (see Table 6).

In sum, the data strongly support the notion that when imbalance is perceived, one main repair strategy is used: Imbalanced interpersonal events are predominantly interpreted as being indicative of specific interactions between the stimulus person and the experiencer. According to our data obtained from ratings concerning covariation information, forced choice and interaction attributions, this kind of repair strategy is accompanied by revisions of covariation information that completely fit these revised attributions (which are contrary to the causal verb schema at work for balanced interpersonal events).

The response latencies obtained for the various judgments assessed in Study 2 confirm this explanation only partially, however. We developed four hypotheses concerning these response latencies, of which three were confirmed: (a) Response latencies for balanced scenarios were generally shorter for verbs with strong (compared with weak) causal implications (confirming Principle 1), (b) judgments about balance versus imbalance were especially fast to make (confirming Principle 2), and, finally, (c) attributions were made more quickly for balanced compared with unbalanced events, indicating that time-consuming repair mechanisms take place (confirming Principle 3).

However, at first sight, the present evidence does not support our fourth hypothesis, that these repair mechanisms (Principle 3) involve a revision of consensus and distinctiveness perceptions. At this point, our rating data and the data obtained from response latencies stand in contrast, especially because covariation judgments took significantly longer than all kinds of attribution measures. An obstacle in interpreting this kind of response latency effects, however, is the fact that covariation judgments are usually not made explicit in causal cognition and constitute a relatively unfamiliar type of judgment. This is especially relevant in view of earlier response time data (Schuster et al., 1998) in which covariation information had proved to be proximal, not distal, to behavioural decisions and consequences. Such decisions were made more quickly when they were based on the presentation of covariation information as opposed to information about attributions. In addition, the influence of perceived covariation turned out to be not mediated by attributions. This makes it appear very likely that covariation is in fact a generic piece of information when it comes to attribute interpersonal events. In Schuster et al.'s (1998) study, participants were presented with consensus and distinctiveness information explicitly. That is, participants were presented statements about how many persons behaved in a similar way, which may have rendered this type of information particularly accessible in

the first place. In the present study, however, participants had to infer consensus and distinctiveness from different verb types, which is likely an effortful and time-consuming process (see Klauer, Meiser, & Naumer, 2000). In such a situation, longer latencies are to be expected. Further research is needed to overcome this problem in the assessment and interpretation of response latencies.

General Discussion

In concluding this article, it seems worth to take a closer look at the balance principle as proposed by Heider (1946, 1958) and its usefulness for the investigation of events as described by interpersonal verbs. It is certainly true that Heider's principle of cognitive balance received a great deal of attention in the 1950s and 1960s (e.g., Abelson & Rosenberg, 1958; Osgood & Tannenbaum, 1955; Zajonc, 1968) but failed to attract further research later on. Unfortunately, this failure to pursue this theory cannot be attributed to the fact that all of its implications have been thoroughly understood.

Interestingly, the early research on various theories of balance can be characterized as being concerned with the validity of the principle itself (Brown & Van Kleeck, 1988; von Hecker, 1993). Researchers analyzed (a) whether participants express preference for balanced rather than unbalanced interpersonal events or states, (b) whether balanced materials are learned more quickly compared with unbalanced ones, and (c) whether unbalanced or incomplete situations or states are completed in a way that creates or increases balance (for an overview, see Markus & Zajonc, 1985; Zajonc, 1968).

Our approach was different from these at least in one respect: In the present studies, we manipulated balance by systematically varying the valence of the effect and the valence of the explanation. This strategy made it necessary to obtain judgments of balance from our participants with respect to language materials with already known linguistic properties. To our surprise, when starting our line of research, we found no "standard" dependent measure for perceived balance of any kind of event (whether interpersonal or not). That is, we found no studies requiring participants to rate their subjective perceptions of balance versus imbalance vis-à-vis different kinds of events or states.

One important research question in this vein is the analysis of the cognitive processes elicited by subjectively, rather than objectively, defined balance versus imbalance. As a consequence, our research provides a first step in investigating a new line of research questions more carefully, namely, the perception of balance in events described by interpersonal verbs and the cognitive processes elicited by this subjective experience. As we view it, more research is certainly needed concerning a principle that governs a great deal of the cognitive map we construe vis-à-vis the data stream available in our social world and that has, as the present studies suggest, eminent effects on perception and language processing. Because interpersonal verbs provide our only, but yet universal, tool for describing interpersonal events (Fillmore,

1968), a better understanding of the mechanisms underlying the comprehension and interpretation of language in terms of balance and causality is a goal worth pursuing.

Appendix
Verbs Used in Studies 1 and 2

Verbs used in Study 1

SE verbs, positive valence	SE verbs, negative valence
charm (bezaubern)	annoy (ärgern)
calm (beruhigen)	worry (beunruhigen)
impress (beeindrucken)	depress (deprimieren)
cheer up (ermuntern)	tire (ermüden)
fascinate (faszinieren)	bore (langweilen)
encourage (ermutigen)	irritate (irritieren)
ES verbs, positive valence	ES verbs, negative valence
admire (bewundern)	regret (bedauern)
love (lieben)	disdain (verachten)
accept (akzeptieren)	hate (hassen)
trust (vertrauen)	endure (erdulden)
revere (verehren)	dread (fürchten)
idolize (vergöttern)	loathe (verabscheuen)

Verbs used in Study 2

Strong verb schema	Weak verb schema
SE verbs, positive valence	
charm (bezaubern)	flatter (schmeicheln)
calm (beruhigen)	impress (beeindrucken)
cheer up (ermuntern)	fascinate (faszinieren)
encourage (ermutigen)	tease (necken)
SE verbs, negative valence	
worry (beunruhigen)	influence (beeinflussen)
depress (deprimieren)	annoy (ärgern)
tire (ermüden)	frustrate (frustrieren)
irritate (irritieren)	bore (langweilen)
ES verbs, positive valence	
love (lieben)	long for (sich sehnen)
accept (akzeptieren)	trust (vertrauen)
revere (verehren)	admire (bewundern)
idolize (vergöttern)	feel sorry for (mitleid haben mit)
ES verbs, negative valence	
deplore (bedauern)	despise (verachten)
hate (hassen)	worry about (sich sorgen um)
suffer from (erdulden)	envy (beneiden)
despise (verachten)	dislike (nicht mögen)

Note: In some respects and in some cases, the English translations of the interpersonal verbs may differ slightly from the German verbs (in parentheses), especially with respect to valence connotations. However, causal schemas and the strength of causal implications probably vary little between languages (Fillmore, 1968).

Notes

1. In Rudolph and Försterling's (1997a) system, there are two more verb categories, namely, agent-patient and actor-evocator verbs. As a previous study has shown, however, these two types parallel SE and ES types of verbs, in that agent-patient verbs are clearly attributed to sentence subjects, whereas actor-evocator verbs are clearly attributed to sentence objects. Because the attribution pattern, not the verb typology per se, was the focus of the present research, we limited our present studies to SE and ES verbs.

2. The terms *friendly* and *unfriendly* might be more relevant to some verbs than others, but we did not expect any systematic differences in relevance between the different verb types. Moreover, the use of different adjectives would have impeded the comparability between different verbs much more than the probably minor variations in relevance.

3. Because balance conditions from different valence-explanation combinations did not differ in terms of the relevant results, positive-positive and negative-negative scenarios were collapsed into the balanced level, as were positive-negative and negative-positive scenarios into the unbalanced level.

4. The expected overall frequency of observations in Table 7 is 32 (number of unbalanced scenarios) × 59 (number of participants) = 1,888. The totals in both tables are slightly below this number because of missing data.

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