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The ISI Change Phenomenon: When Contradicting One Stereotype Changes Another

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Abstract

When a population is perceived to consist of two mutually exclusive and exhaustive groups, the stereotypes that people form of these groups are likely to be interdependent. We predicted that stereotype-incongruent information about members of one group (target group) may then evoke change in the stereotype of another group (alternative group) even in the absence of any stereotype-incongruent information about members of the alternative group. We demonstrated this Indirect Stereotype-Incongruence Induced (ISI) Change phenomenon in two studies using novel groups (study 1 & 2). The effect occurred when the incongruent information was about a competent target group (changing the stereotype about the less competent alternative group) but not when it was about an incompetent target group (study 2). The ISI change phenomenon implies that stereotypes may change even in the absence of directly stereotype-incongruent information.

Keywords: Stereotype change, stereotype-congruent information, stereotype-incongruent information, stereotype learning paradigm, Indirect Stereotype-incongruence Induced (ISI) change phenomenon

The ISI Change Phenomenon: When Contradicting One Stereotype Changes Another

Imagine you see men kindly nursing their children, youngsters laboriously trying to get on the bus, or black athletes failing during the world championships. It may seem no more than understandable if these observations would change your stereotypes of men, youngsters, and black athletes, respectively. However, would they also change your stereotypes of women, elderly people, and white athletes? May observing nurturing men reduce the extent to which you believe that women are nurturing? Would observing physically challenged youngsters reduce your belief that elderly people are physically challenged? And is observing underperforming black athletes sufficient to make you believe that white athletes are better than you always thought?

More generally stated: Is it possible that stereotypes are interdependent so that stereotype-incongruent information about members of one group affects not only observers' stereotype of that group but also their stereotype of an alternative group—even in the absence of any stereotype-incongruent information about members of that alternative group? The present research addressed this question. To the best of our knowledge, the effect of information that is incongruent with one stereotype on the content of another stereotype has not been studied before. However, our research is grounded in conceptualizations of stereotypes as representations of group differences. In addition, the idea of interdependence *between* stereotypes has a theoretical counterpart in the idea that stereotypical beliefs may be interdependent *within* stereotypes.

Stereotypes as intergroup differences

Stereotypes may be viewed as beliefs concerning the characteristics, attributes and behaviors of members of social groups (Hilton & Hippel, 1996). Because stereotypes also describe how a group stands out against other groups, however, they are often

thought of as beliefs about group differences (Biernat & Crandall, 1996; Campbell, 1967; Ford & Stangor, 1992; Martin, 1987; McCauley & Stitt, 1978; McCauley, Stitt, & Segal, 1980). For instance, McCauley et al. (1980) defined stereotypes as ‘generalizations about a class of people that distinguish that class from others’ (p. 197). Supporting this conceptualization, attributes that differentiate two groups are more strongly associated with the stereotypes of these groups (Ford et al., 1992).

The intergroup difference perspective on stereotypes renders it intriguing that in social psychological research stereotypes have almost exclusively been studied independently from other stereotypes. Stated differently, they have been treated as knowledge entities about isolated groups rather than as knowledge entities about how groups differ from other groups.

Admittedly, studying stereotypes in isolation is justified when these stereotypes are about groups that coexist with a large number of comparable other groups. In these cases, the implications of any given stereotype for the other stereotypes are unclear and, for most practical purposes, negligible. For instance, the professional group ‘professors’ coexists with a large number of other professional groups. As such, it is unclear what – if anything – the stereotypical belief that professors are distracted implies for the stereotype of, say, plumbers, nurses, and professional soccer players. It is possible that professors are seen as slightly more distracted than members of any other group or that they seem much more distracted than members of one particular group, as equally distracted as members of another group, and as somewhat less distracted than members of yet another group.

Yet treating stereotypes as independent knowledge structures may not be adequate when a population is psychologically divided into two mutually exclusive and

exhaustive groups. A population is divided into two mutually exclusive and exhaustive groups if each of its members belongs to exactly one of two groups. Because stereotypes particularly serve to differentiate between groups (Ford & Stangor, 1992), the stereotypes about the two groups are then conceptually interdependent in that attributing a characteristic to one group implies relatively denying that characteristic to the other group. As a consequence, issues such as stereotype change and maintenance cannot be comprehensively studied without taking this interdependence into account.

Of course, populations that objectively consist of two mutually exclusive and exhaustive groups are rare if not non-existent. Even gender groups are not completely mutually exclusive and exhaustive (cf. sexually undifferentiated and hermaphrodite individuals). Psychologically, however, the issue is whether a population is *thought of* as consisting of two mutually exclusive and exhaustive groups. Stereotypes are constructs that people apply to the psychological structure of their environment. While studying these stereotypes' nature and the functioning, therefore, people's perceptions are relevant rather than their environment's 'objective' structure. For instance, most people see men and women as two mutually exclusive and exhaustive groups. Similarly, they divide humankind into 'children' and 'adults', adult people into 'elderly' and 'non-elderly' or into 'employed' and 'unemployed', and couples into 'with children' and 'childless'. Neither of these distinctions is truly exclusive and exhaustive (e.g. what about adolescents, advanced middle-agers, independent artists, and couples with shared parenthood?) yet from a psychological point of view they generally are.

Furthermore, during stereotype formation perceivers categorize individuals in groups that are meaningfully related to each other (Mackie, Hamilton, Susskind & Rosselli, 1996; McGarty, Yzerbyt & Spears, 2002). Attributes that differentiate between

groups become part of the stereotype whereas attributes that the groups share do not (Ford & Stangor, 1992). Tajfel and Turner (1979) stated that this intergroup differentiation depends on the importance of group membership for the perceiver's self-concept, the possibility of social comparison, and the relevance of comparison which in turn depends on similarity, proximity and situational salience. It is to be expected, then, that within societies complementary stereotypes emerge and become anchored.

However, complementary stereotypes may also temporarily emerge. For instance, if a scientific conference and a writers' conference are held at the same location then the caterers may meaningfully compare the attendants of the two conferences. This may lead to an interdependent relation between the stereotypes these caterers hold of scientists and artists even though the groups are not mutually exclusive and exhaustive.

Dependence and independence between and within stereotypes

Theory and research on the interdependence of beliefs *within* stereotypes suggest that it is not farfetched to propose interdependence *between* stereotypes. The stereotype content model (SCM) states that the dimensions of warmth and competence dominate social perception in general and the content of stereotypes in particular (e.g. Fiske, Cuddy, Glick, & Xu, 2002), with most social groups seeming either high on warmth and low on competence or high on competence and low on warmth. Interestingly, information about one dimension affects stereotypical beliefs on the other dimension (Cuddy, Fiske, & Glick, 2004; Cuddy, Norton, & Fiske, 2005; Heilman & Okimoto, 2007). For instance, parenthood enhances perceived warmth in both men and women. For women, however, it also decreases perceived competence (Cuddy et al., 2004). Similarly, elderly people who act competently seem colder than elderly people who act incompetently (Cuddy et al., 2005).

Some evidence on compensatory processes in stereotyping also supports the idea of interdependence between stereotypes. For instance, when one group scores higher than another group on one basic dimension, observers may come to believe that the second group scores higher on the alternative dimension (Kervyn, Yzerbyt, Demoulin, & Judd, 2008; Kervyn, Judd & Yzerbyt, 2009; Kervyn, Yzerbyt, & Judd, 2010). If a target group outperforms a comparison group on one dimension, observers assume that it does worse than the comparison group on the alternative dimension, and vice versa.

Indirect Stereotype-Incongruencecongruence Induced Change?

The interdependence of stereotypes carries potential implications for the effects of stereotype-incongruent information on these stereotypes. More specifically, it implies that two types of information are incongruent with a group stereotype. The first type may be called ‘directly incongruent information’ and consists of unexpected information about members of the relevant group. The second type may be called ‘indirectly incongruent information’ and consists of unexpected information about members of an alternative group. Take, for instance, the stereotypical belief that women are relatively empathic whereas men are relatively un-empathic. In this case, information about empathic men is directly incongruent with the stereotype of men and indirectly incongruent with the stereotype of women.

Thus far, research in the domain of stereotype change has focused on directly stereotype-incongruent information to the neglect of indirectly stereotype-incongruent information. We therefore examined whether indirectly stereotype-incongruent information affects stereotypes as well. If it does, it would imply that stereotype-incongruent information about one group (the target group) may not only affect the stereotype about that group but also the stereotype about another group (the alternative

group) even in the absence of any directly incongruent information about the latter group. We named this hypothesized—and, to the best of our knowledge, thus far untested—phenomenon *Indirect Stereotype-incongruencecongruence Induced (ISI) Change*.

Moderators of stereotype interdependence

Our prediction of “Indirect Stereotype-incongruencecongruence Induced (ISI) Change” may seem at odds with research revealing what we would like to name “Direct Stereotype-incongruent Induced (DSI) Change” Only. Stated differently, stereotype change seems to occur in the absence of change in closely related stereotypes. For instance, research inspired by dynamic gender stereotypes theory has revealed that, over the last few decades, stereotypes of women have changed more than stereotypes of men have (Diekmann & Eagly, 2000). Yet the hypotheses of “ISI Change” and “DSI Change” may be reconciled by refining the former to imply that only stereotype-incongruent information about a competent group may change the stereotype of an incompetent group whereas stereotype-incongruent information about an incompetent group may not change the stereotype of a competent group. For instance, stereotype-incongruent information about men (perceived as relatively competent) may change the stereotype of women (perceived as relatively incompetent) whereas stereotype-incongruent information about women may not change the stereotype of men.

Indirectly supporting the idea that stereotype-incongruent information about a competent group may change the stereotype of an alternative incompetent group but not vice versa, group status (known to be associated with perceived competence, cf. Brombilla, Sacchi, Castellini, & Riva, 2010; Oldmeadow & Fiske, 2007) affects how people process stereotype-incongruent information. People seem to process stereotype-

incongruent information in a more unbiased manner if it is about high status groups than if it is about low status groups (Sekaquaptewa & Espinoza, 2004). When they explain behaviors of low status group members, for instance, stereotype-incongruent behaviors are more often externally attributed than stereotype-congruent behaviors. When people explain behaviors of high status group members, stereotype-incongruent behaviors and stereotype-congruent behaviors are not differentially attributed. Interestingly, stereotypes change when stereotype-incongruent behaviors are internally attributed but not when they are externally attributed (Wilder, Simon, & Faith, 1996). If people encounter stereotype-incongruent behaviors by competent target group members, then, they may attribute these behaviors to internal and stable factors and accordingly change their view of the target group as well as that of the alternative group. If people encounter stereotype-incongruent behaviors by incompetent target group members, they may attribute these behaviors to external factors and hence not or to a small extent change their view of the target group and certainly not change their view of the alternative group.

The present research

We tested the ISI Change phenomenon in two studies, both using artificial stereotypes. The first study was an initial test of the hypothesis that stereotype-incongruent information about a target group may not only change the stereotype of the target group but also the stereotype of the alternative group. The second study investigated whether this effect depended on the group from whose perspective the stereotype-incongruent information was directly incongruent. It tested the hypothesis that stereotype-incongruent information about a target group would provoke greater

stereotype change in the alternative group if the target group was perceived as more competent than when it was perceived as less competent.

In a first phase (stereotype learning phase), participants learned experimenter-designed stereotypes of two mutually exclusive and exhaustive fictional groups. In a second phase (additional information phase), they received additional information about individual group members. This information was either stereotype-congruent for both groups or directly stereotype-congruent for one group and directly stereotype-incongruent for the other group. Participants' stereotypes of both groups were measured twice: once after the stereotype learning phase and once after the additional information phase. On the basis of the first measurement we selected the participants who had learned the appropriate stereotypes for inclusion in our analyses. By comparing the two measurements we examined how the additional information affected these stereotypes.

We used artificial stereotypes because doing so allowed controlling characteristics of stereotypes that are hard or even impossible to control in real-life stereotypes. These characteristics include the stereotypes' content, the manner in which participants have learned them, and the informational basis on which they are based (Hicklin & Wedell, 2007). In addition, using artificial stereotypes allowed comparing the 'truth' about the groups with how participants view these groups (Biernat & Crandall, 1996).

Previous studies have used various procedures to create artificial stereotypes, including presenting verbal summaries of group characteristics (Plaks et al., 2001; Spencer-Rodgers, Williams, Hamilton, Peng, & Wang, 2007) and providing participants with information about one group member at a time (Biernat & Crandall, 1996; Manis, Nelson, & Shedler, 1988; Manis, Paskewitz, & Scotler, 1986). In some studies using the latter approach, participants were presented with information either until they had

learned the relevant stereotype or until they had reached a maximum number of learning blocks (Hicklin & Wedell, 2007).

For our purposes, it was important to keep the stereotype learning phase and the additional information phase as comparable as possible. In order to avoid undue error variability, it was also important to keep the informational basis on which the initial stereotypes were formed constant over participants. We therefore used a newly developed stereotype learning paradigm. In the stereotype learning phase participants encountered information about the characteristics of individual group members (one group member at a time). This allowed both precisely manipulating the central tendency as well as the variability of the stereotype-relevant information and comparing participants' judgments with actual stimulus characteristics. In addition, we presented all participants with a constant amount of information and measured to which extent they had learned the relevant stereotypes rather than presenting participants with varying amounts of information depending on their learning curves. We did so to keep the informational base of the initial stereotype formation and subsequent stereotype change rigorously constant within conditions and, where intended, between conditions.

Study 1

In study 1 we used the stereotype learning paradigm to test the hypothesis that stereotype-incongruent information about a target group may change the stereotype of the alternative group as well as the stereotype of the target group. In the stereotype learning phase, participants learned about the extent to which the members of two mutually exclusive and exhaustive groups possessed two skills. The stereotypes were complementary in that each group scored well on one skill and badly on another, with the two groups scoring well versus badly on different skills. In the additional

information phase participants saw either information that was stereotype-congruent for both groups or information that was directly stereotype-incongruent for one group (target group) and directly stereotype-congruent for the other group (alternative group). The amount of information that was presented to participants in both phases of the experiment was such that if participants equally weighted the initial information and the additional information, in the stereotype-incongruent conditions their stereotype of the target group should be eradicated.

We predicted that stereotype-congruent information about both groups would leave both stereotypes unaffected. We also predicted that stereotype-incongruent information about the target group would reduce and perhaps even eradicate the stereotype of the target group. Most importantly, we predicted that stereotype-incongruent information about the target group would also change the stereotype of the alternative group.

Method

Participants. The original sample consisted of 171 Belgian Dutch-speaking students of social sciences (60 men & 110 women, mean age 19, range 18–39). Of these participants, 94 (33 men & 61 women) learned the stereotypes in the stereotype learning phase and were therefore included in the main analyses. Ethical guidelines for research participation were followed in this and in the subsequent experiment.

Procedure. Participants were welcomed in groups of one to ten. The experiment was presented as a study on how people interpret scientific results. After completing an informed consent form, participants were seated in individual cubicles equipped with personal computers and informed that detailed instructions would appear on the screen. The instructions then informed participants about (fictitious) research of the Department of Psychology on perceptual styles. This research had allegedly brought to light that

when people view visual stimuli some attend to the figure before attending to the background (core-perceivers) while others attend to the background before attending to the figure (field-perceivers).

After this general introduction, the stereotype learning phase began. Participants read that a recent study had examined differences in thinking style as a function of perceptual style. Two tests of scientific and creative thinking had allegedly been used, namely, the Tobin and Capie Test of Logical Thinking (TOLT; Tobin & Capie, 1981) and the Torrance Test of Creative Thinking (TTCT; e.g. Kim, 2006), respectively. The TOLT was (truthfully) described as a reliable test of various aspects of scientific thinking, including proportional reasoning, probabilistic reasoning, combinational reasoning, correlational reasoning and variable control. The TTCT was (also truthfully) described as a reliable test of creative thinking. For each test participants were presented with a table that translated test scores into a 7-point scale of scientific thinking and creative thinking (1 = *very low*, 2 = *low*, 3 = *rather low*, 4 = *moderate*, 5 = *rather high*, 6 = *high*, 7 = *very high*).

After they had studied this introductory information about the TOLT and the TTCT participants received test results of seven core-perceivers and of seven field-perceivers. These individuals were identified by their group name (core-perceivers versus field-perceivers), a symbol representing their group (a black circle in a white square for core-perceivers and a white circle in a black square for field-perceivers), and a number. The test results were represented by their verbal labels. Participants received the information for one individual at a time and for both tests at the same time.

Complementary stereotypes were created by having all members of one group obtain high scores on one test and low scores on the other test and by having all

members of the other group obtain high scores on the latter test and low scores on the former test. Each group thus had a test on which its members scored well (*high-test*) and a test on which its members did not score well (*low-test*) with the “high-test” and the “low-test” differing between groups. The mean score on the high-test was 6 (‘high’ on the verbal scale) whereas the mean score on the low-test was 2 (‘low’ on the verbal scale). The variance was 0.67 in each case.

In the initial measurement phase we measured how well participants had learned the intended stereotypes. We first asked participants to imagine that all members of both groups would be tested and to estimate the mean scores core-perceivers and field-perceivers would obtain on 7-point scales ((1 = *very low*, 2 = *low*, 3 = *rather low*, 4 = *moderate*, 5 = *rather high*, 6 = *high*, 7 = *very high*). Immediately after each rating participants indicated how certain they were of it on a 6-point scale (1 = *very uncertain*, 2 = *uncertain*, 3 = *rather uncertain*, 4 = *rather certain*, 5 = *certain*, 6 = *very certain*). In addition, we examined the perceived variability within each group. To this end we let participants rate how much, according to them, the scores of the lowest and highest scoring member of each group would differ. They responded on a 7-point scale ranging (0 = *no variability at all*, 6 = *maximal variability*: 7-1).

After the initial measurement phase participants were informed that they would view some additional test results. In this additional information phase we manipulated the degree to which the additional information was congruent versus incongruent with the stereotypes participants had just learned.

In the “*congruent condition*” participants viewed stereotype-congruent information about 12 individuals (six core-perceivers and six field-perceivers; mean score 6 on the high-test and mean score 2 on the low-test) and stereotype-incongruent information

about two individuals (one core-perceiver and one field-perceiver, score 2 on the high-test and score 6 on the low-test). The incongruent member per group was included to enhance credibility. Previous research has shown that such a single incongruent member may be sufficient to increase the perceived variability within a stereotyped group yet does not change the perceived group mean (Paolini, Hewstone, Rubin, & Pay, 2004).

In the “*incongruent condition*”, participants viewed stereotype-incongruent information about six target group members and about one alternative group member (mean score 2 on the high-test and mean score 6 on the low-test). They received stereotype-congruent information about six alternative group members and about one target group member (mean score 6 on the high-test and mean score 2 on the low-test). The variance was 3.33 within each group-test combination.

The second measurement phase was identical to the first measurement phase. After completing it participants took part in two unrelated experiments and were thanked, partially debriefed, and dismissed. Full debriefing occurred during a class hour.

Design. We manipulated the stereotype-congruence of the additional information between subjects (congruent vs. incongruent). The design implied that participants answered questions about scores on two tests for two groups and at two moments in time. We included the latter three variables as within-subjects variables. The full experiment thus consisted of a 2 (congruence: congruent vs. incongruent) x 2 (group: target group vs. alternative group) x 2 (test: high-test vs. low-test) x 2 (timing: before vs. after receiving additional information) design.

We counterbalanced the combinations of perceptual and thinking style. In the stereotype learning phase half of the participants learned that core-perceivers were good at scientific thinking and bad at creative thinking whereas field-perceivers were good at

creative thinking and bad at scientific thinking. The other half learned that core-perceivers were good at creative thinking and bad at scientific thinking whereas field-perceivers were good at scientific thinking and bad at creative thinking. In the stereotype learning phase and in the additional information phase the targets appeared in a random order. In both measurement phases the questions about the two groups and the two tests also appeared in a random order. The target group and alternative group was counterbalanced in the additional information phase of the incongruent condition. Half of the participants received generally stereotype-incongruent information about core-perceivers and generally stereotype congruent information about field-perceivers. The other half of the participants received generally stereotype-incongruent information about field-perceivers and stereotype congruent information about core-perceivers.

Results

Introductory remarks. The criterion for including participants in the principal analysis was that they had learned the relevant stereotype in the stereotype learning phase. We presumed that participants learned the stereotype if they rated the mean group scores higher on the high test than on the low test for both groups. Of the originally 171 participants 94 achieved this criterion. These 94 participants were included in the principal analysis.

We performed separate ANOVA's on mean group ratings, certainty ratings, and variance ratings. The independent variables were test, group, and timing as within-subject variables, and stereotype-congruence as a between-subject variable. In a preliminary analysis we included version (creative core-perceivers and scientific field-perceivers vs. scientific core-perceivers and creative field-perceivers) as a

between-subject variable. Because this variable did not affect stereotype change, for ease of presentation we dropped it from the final analyses.

Ratings of the group mean. Normatively, the additional information should not affect stereotypes in the congruent condition and eradicate the stereotype of the target group in the incongruent condition (i.e. heighten their scores on the low-tests and lower their scores on the high-test). If directly stereotype-incongruent information is the only type of incongruent information that affects stereotypes, then the stereotype of the alternative group should remain unaffected in the incongruent condition. In contrast, if indirectly stereotype-incongruent information also affects stereotypes, as our hypothesis implies, then the stereotype of the alternative group should change in the direction opposite to the change in the target group. We therefore predicted a four-way interaction of test, group, timing, and stereotype-congruence, with the crucial difference between the hypotheses being the precise form this four-way interaction should take.

The four-way interaction was indeed significant, $F(2,91) = 14.31, p < .001, \eta^2 = .136$. In addition, we found a main effect of test $F(1,91) = 613.40, p < .001, \eta^2 = .871$, a two-way interaction of test and stereotype-congruence, $F(2,91) = 9.56, p = .003, \eta^2 = .095$, a two-way interaction of test and timing $F(1,91) = 121.22, p < .001, \eta^2 = .510$, a two-way interaction of test and group, $F(1,91) = 5.55, p = .021, \eta^2 = .058$, a three way interaction of test, timing, and stereotype-congruence, $F(2,91) = 33.45, p < .001, \eta^2 = .269$, a three way interaction of test, group and stereotype-congruence, $F(1,91) = 14.05, p < .001, \eta^2 = .134$, and a three way interaction of test, group and timing, $F(1,91) = 5.71, p = .019, \eta^2 = .059$. In order to understand these effects we performed separate ANOVA's per stereotype-congruence condition using paired T-tests for further exploration.

In the “*congruent condition*,” as expected, the ANOVA yielded only a significant main effect of test, $F(1,29) = 265.7, p < .001$, with participants rating both groups higher on the high-tests ($M = 5.5, SD = 0.1$) than on the low-tests ($M = 2.7, SD = 0.1$). The Test x Group x Timing interaction, $F(1,29) = .821, p = .372, \eta^2 = .028$, did not approach significance. This shows that merely adding information did not affect (neither enhanced nor deluded) the stereotypes created in the stereotype learning phase.

In the “*incongruent condition*” (Figure 1), also as expected, we found an interaction of test, group and timing, $F(1,62) = 27.84, p < .001, \eta^2 = .310$. The additional information changed participants’ stereotype of the target group. Participants rated the target group lower on the high-test after viewing the additional information ($M = 3.9, SD = 1.35$) than before viewing it ($M = 5.9, SD = 0.56$), $t(62) = 11.21, p < .001$. Similarly, they rated the target group higher on the low-test after viewing the additional information ($M = 4.3, SD = 1.36$) than before viewing it ($M = 2.2, SD = 0.65$), $t(62) = 11.19, p < .001$. The additional information even completely eradicated their stereotype of the target group with the high-test and the low-test no longer differing from each other after participants had viewed this additional information, $t(62) = 1.02, p = .31$. Importantly, the additional information also changed participants’ stereotype of the alternative group. Participants rated the alternative group lower on the high-test after viewing the additional information ($M = 5.1, SD = 1.09$) than before viewing it ($M = 5.8, SD = 0.67$), $t(62) = 4.44, p < .001$. They rated the alternative group higher on the low-test after viewing the additional information ($M = 3.2, SD = 1.25$) than before viewing it ($M = 2.3, SD = 0.69$), $t(62) = 11.19, p < .001$. Yet the additional information did not completely eradicate the stereotype of the alternative group, with the high-test

and the low-test still differing from each other after participants had viewed it, $t(62) = 7.60, p < .001$.

 Insert Figure 1 about here

Certainty ratings. The ANOVA on the certainty ratings only yielded a main effect of timing, $F(1,92) = 7.6, p = .007, \eta^2 = .076$. Participants were more certain about their ratings before viewing the additional information ($M = 3.9, SD = 0.77$) than after viewing it ($M = 3.7, SD = 0.79$). No other effects approached significance, all F 's < 3.7 , all p 's $> .05, \eta^2 < .039$.

Variability ratings. The ANOVA on the variability ratings yielded a main effect of timing, $F(1, 89) = 7.6, p = .007, \eta^2 = .079$, and an interaction of timing and test, $F(1,89) = 7.2, p = .009, \eta^2 = .075$. During the first assessment phase the variance rating for both the high test ($M = 3.1, SD = 1.52$) and the low test ($M = 3.3, SD = 1.48$) were lower than during the second assessment phase (high test: $M = 3.8, SD = 1.53$, low test: $M = 3.7, SD = 1.45$), $t(93) = 3.6, p = .001$, and $t(93) = 2.5, p = .013$, respectively.

Discussion

In study 1 we found support for the hypothesis that massive stereotype-incongruent information about the members of a target group may not only completely eradicate the stereotype of that target group but also reduce (yet not eradicate) the stereotype of an alternative group. Besides implying that stereotypes are interdependent, this ISI Change phenomenon carries at least two additional important implications. First, the stereotype of a group may change in the absence of stereotype-incongruent information about

members of that group. Second, changing one stereotype may change another stereotype.

However, Study 1 had two important limitations. First, the dimensions of scientific thinking (TOLT) and creative thinking (TTCT) were negatively correlated. If a group did well on one thinking style, it did badly on the other thinking style. This negative correlation may have suggested to the participants a rule of thumb dictating that ‘if one of two elements is good, the other must be bad’. Applying this rule of thumb to the relationship between the two stereotypes may have inflated the observed effects. To rule out this possibility, we wished to replicate the effect in a situation that did not include a strong negative correlation between the two dimensions of the relevant stereotypes.

Second, study 1 did not investigate the nature of the stereotype-incongruent information that was necessary to induce the ISI Change phenomenon. The stereotype-incongruent information always implied that group members did worse than expected on the high-test *and* that they did better than expected on the low-test. As such, Study 1 is silent about whether the ISI change phenomenon occurs if members of a high-scoring group do worse than expected, if members of a low-scoring group do better than expected, or in both cases. As noted in the introduction, understanding when the effect occurs may hold the key towards solving the apparent contradiction between our hypothesis on the one hand and previous research suggesting independent stereotype change on the other hand.

Study 2

Study 2 examined the boundary conditions of the ISI Change phenomenon while addressing the limitations of Study 1. It investigated whether the change occurs when the two dimensions of the relevant stereotypes are not perfectly correlated. Study 2 also

examined whether the ISI Change phenomenon depends on the relative competence of the target group and the alternative group. More specifically, Study 2 tested the hypothesis that the ISI Change phenomenon would occur when members of a relatively competent target group (i.e. the group of which the initial stereotype implied that it was superior to the alternative group) perform worse than expected but not when members of a relatively incompetent target group (i.e. the group of which the initial stereotype implied that it was inferior to the alternative group) perform better than expected.

Participants learned that one group scored well (competent group) and another group scored poorly (incompetent group) on a test measuring one skill (extreme test), with both groups scoring moderately on a test measuring another skill (average test). Participants then received stereotype-congruent information about both groups, directly stereotype-incongruent information about the competent group and directly stereotype-congruent information about the incompetent group, or directly stereotype-incongruent information about the incompetent group and directly stereotype-congruent information about the competent group. We predicted that stereotype-incongruent information about the target group would change not only the stereotype of the target group but also the stereotype of the alternative group. Based on the literature about independent stereotype change we also predicted that the stereotype of the alternative group would change more when the stereotype-incongruent information was about the competent target group than when it was about the incompetent target group.

Method

Participants. The original sample consisted of 204 Belgian Dutch-speaking students of social sciences (67 men and 137 women). Of these participants, 120 (37 men and 83 women) learned the stereotypes. Their mean age was 19.5 (range 17 – 45).

Procedure. Study 2 was identical to Study 1 except for the following. In the stereotype learning phase the participants viewed test scores suggesting that one group (competent group) did well on one thinking style (mean score 6, variance 3.33) and that the other group (incompetent group) did poorly on that thinking style (mean score 2, variance 3.33). Both groups showed an average performance on the other thinking style (mean score 4, variance 4.67). We will further name the test for which all group members allegedly obtained an average score the ‘average test’ and the test on which group members allegedly obtained a high or a low score the ‘extreme test’.

In the additional information phase participants in the “*congruent condition*” viewed stereotype-congruent information about six members of each group and stereotype-incongruent information about one member of each group. Participants in the “*competent-incongruent condition*” viewed stereotype-incongruent information about six members of the competent group (mean score 2 on the extreme test), and stereotype-congruent information about one member of the competent group (score 6 on the extreme test). They received stereotype-congruent information about six members of the incompetent group (mean score 2 on the extreme test) and stereotype-incongruent information about one member of the incompetent group (score 6 on the extreme test). Participants in the “*incompetent-incongruent condition*” viewed stereotype-incongruent information about six members of the incompetent group (mean score 6 on the extreme test), and stereotype-congruent information about one member of the incompetent group (score 2 on the extreme test). They received stereotype-congruent information about six members of the competent group (mean score 6 on the extreme test) and stereotype-incongruent information about one member of the competent group (score 2 on the extreme test). The information about the average test was always stereotype-congruent.

The variance of the information in the additional information phase was 3.33 for the extreme test and 4.67 for the average test.

Design. Study 2 consisted of a 3 (congruence: congruent vs. competent-incongruent vs. incompetent-incongruent) x 2 (group: competent group vs. incompetent group) x 2 (test: extreme test vs. average test) x 2 (timing: before vs. after viewing additional information) design. Congruence was manipulated between subjects whereas group, test and timing were manipulated within subjects.

Similar precautions against confounds were taken as in Study 1. Half of the participants initially learned that core-perceivers were competent and that field-perceivers were incompetent whereas the other half learned that field-perceivers were competent and that core-perceivers were incompetent. Orthogonally to this counterbalancing, for half of the participants the extreme test measured scientific thinking whereas for the other half the extreme test measured creative thinking.

Results

Introductory remarks. Again, the criterion for including participants in the principal analysis was that they had learned the stereotypes. We presumed that participants had learned the stereotype if they rated the mean group score higher for the competent group than for the incompetent group on the extreme test at the first measurement. Of the originally 204 participants 120 achieved this criterion. These 120 participants were included in the principal analysis.

As in Study 1, we performed separate ANOVA's on mean group ratings, certainty ratings, and variance ratings. The independent variables were congruence as a between-subject variable and group, test, and timing as within-subject variables. In a preliminary analysis we also included version (creative core-perceivers vs. scientific core-perceivers

vs. creative field-perceivers vs. scientific field-perceivers) as a between-subject variable. Because this variable did not affect stereotype change, we dropped it from the final analyses.

Ratings of the group mean. Normatively, in the congruent condition the additional information should not affect stereotypes. In the competent-incongruent condition it should eradicate the stereotype of the competent group (reflected by lowered scores on the extreme test) whereas in the incompetent-incongruent condition it should eradicate the stereotype of the incompetent group (reflected by heightened scores on the extreme test). Based on study 1 we also expected that the stereotype of the alternative group would change in a direction complementary to the stereotype change for the target group. However, we expected that this change in the alternative group would be stronger when the target group was the competent group than when it was the incompetent group. We therefore again expected a four-way interaction of congruence, group, test, and timing.

The four-way interaction was indeed significant, $F(2,115) = 9.02, p < .001, \eta^2 = .136$. We also found a main effect of congruence, $F(2,115) = 10.5, p < .001, \eta^2 = .154$, a main effect of group, $F(1,115) = 108.9, p < .001, \eta^2 = .486$, two-way interactions of congruence and timing, $F(2,115) = 5.9, p = .004, \eta^2 = .093$, of group and timing, $F(1,115) = 45.3, p < .001, \eta^2 = .283$, and of group and test, $F(1,115) = 169.5, p < .001, \eta^2 = .543$, and three-way interactions of congruence, group, and timing, $F(1,115) = 31.9, p < .001, \eta^2 = .038$, and of congruence, test, and timing, $F(2,115) = 4.3, p = .035, \eta^2 = .120$. We explored these effects by performing separate ANOVA's per stereotype-congruence condition and by using paired T-tests for further exploration.

In the “*congruent condition*” the additional information did not change participants’ stereotypes. The ANOVA yielded a main effect of group, $F(1,38) = 41.5, p < .001, \eta^2 = .522$, and an interaction of group and test, $F(1,38) = 60.5, p < .001, \eta^2 = .614$. On the extreme test participants rated the competent group ($M = 5.1, SD = 0.7$) higher than the incompetent group ($M = 3.3, SD = 0.7$), $t(39) = 11.4, p < .001$. On the average test they rated both groups equally, $t(39) = 0.7, p = .491$. Neither the Test x Timing interaction nor the Group x Test x Timing interaction approached significance, F ’s $< 1.2, p$ ’s $> .27, \eta^2 < .002$. In sum, merely adding information neither enhanced nor deluded the newly learned stereotypes.

In the “*competent-incongruent condition*” (see Figure 2), the interaction of group, test, and timing was significant, $F(1,39) = 39.5, p < .001, \eta^2 = .503$. As expected, the additional information reduced the stereotype of the target group. On the extreme test participants rated the competent group lower after viewing the additional information ($M = 3.6, SD = 1.1$) than before viewing it ($M = 5.4, SD = 0.7$), $t(39) = 7.9, p < .001$. On the average test participants did not rate the competent group differently before versus after viewing the additional information, $t(39) = 1.3, p = .21$. The additional information completely eradicated participants’ stereotype of the competent group, with the extreme test and the average test no longer differing after participants had viewed it, $t(39) = 2.4, p = .02$. Replicating the main finding of Study 1, the additional information also reduced the stereotype of the incompetent group. On the extreme test participants rated the incompetent alternative group higher after viewing the additional information ($M = 3.7, SD = 1.0$) than before viewing it ($M = 3.0, SD = 0.7$), $t(39) = 3.4, p = .002$. On the average test they did not rate the incompetent alternative group differently before versus after viewing the additional information, $t(39) = .58, p = .57$. The additional information

completely eradicated the stereotype of the incompetent alternative group, with the extreme test and the average test no longer differing after participants had viewed it, $t(39) = 1.6, p = .11$.

 Insert Figure 2 about here

In the “*incompetent-incongruent condition*” (see figure 3), the interaction of group, test, and timing was significant, $F(1,38) = 8.7, p = .005, \eta^2 = .187$. Again, the additional information reduced the stereotype of the target group. On the extreme test participants rated the incompetent group higher after viewing the additional information ($M = 4.2, SD = 1.0$) than before viewing it ($M = 2.9, SD = 0.6$), $t(39) = 6.6, p < .001$. On the average test participants did not rate the incompetent group differently before and after viewing the additional information, $t(39) = 0.4, p = .73$. The additional information completely eradicated the stereotype of the incompetent group, with the extreme test and the average test no longer differing after participants had viewed it, $t(39) = 1.5, p = .34$. However, the additional information did not change participants’ stereotype of the competent alternative group, all t ’s(39) $< 1.4, p > .16$.

 Insert Figure 3 about here

Certainty ratings. We expected that the stereotype-incongruent information would render participants less certain about their stereotypes. We therefore expected an interaction of congruence and timing. This interaction was indeed significant, $F(2,117) = 3.6, p = .031, \eta^2 = .057$. Being confronted with stereotype-incongruent information

about an incompetent group made participants less certain about their ratings (second measurement: $M = 3.1$, $SD = 0.8$; first measurement: $M = 3.4$, $SD = 0.7$), $t(39) = 2.1$, $p = .040$. However, being confronted with stereotype-incongruent information about a competent group did not make them less certain, $t(39) = 0.7$, $p > .4$. Neither did being confronted with stereotype-congruent information, $t(39) = -1.6$, $p > .10$. The ANOVA on the certainty measures also yielded a main effect of group, $F(1, 117) = 14.5$, $p < .001$, $\eta^2 = .110$, and an interaction of group, test and congruence, $F(2, 117) = 3.7$, $p = .027$, $\eta^2 = .060$. We will not explore these results any further because they are not relevant for our research questions.

Variance ratings. The ANOVA only yielded a main effect of test, $F(1, 115) = 4.2$, $p = .034$, $\eta^2 = .035$. The participants accurately perceived scores on the extreme test ($M = 3.9$, $SD = 1.1$) as less variable than scores on the average test ($M = 4.1$, $SD = 1.0$).

Discussion

Study 2 replicated the findings of Study 1. More importantly, it showed that the indirect stereotype change that occurred in Study 1 was not an artifact of some ‘if one is good, the other must be bad’ rule of thumb. Also importantly, Study 2 revealed an important boundary condition to it. The ISI Change phenomenon occurred if members of an initially competent group performed incompetently. In this case, participants adjusted not only their view of the target group but also their view of the alternative group. The ISI Change phenomenon did not occur when members of an initially incompetent group performed competently. In this case, participants correctly adjusted their view of the target group without changing their view of the alternative group. Stereotype-incongruent information about a competent target group even completely eradicated the stereotype of both the target and the alternative group. Stereotype-

incongruent information about an incompetent target group eradicated the stereotype of that target group and left the stereotype of the alternative group correctly unaffected. The phenomenon thus depends on the relative competence of the target group and the alternative group.

General Discussion

Study 1 and Study 2 were the first to demonstrate the ISI Change phenomenon.

Stereotype-incongruent information about a target group may change not only the stereotype about that target group but also the stereotype about an alternative group. As shown in Study 2, this effect depends on the focus of the stereotype-incongruent information. It occurs if the target group initially outperformed the alternative group but not if the alternative initially outperformed the target group on the stereotyped skill.

Study 2 ruled out a least two obvious artifactual explanations for the ISI Change phenomenon. First, the phenomenon does not occur because participants apply a rule of thumb stating that ‘if one is good, the other must be bad and vice versa’ or ‘if one improves, the other must deteriorate and vice versa’. Such an explanation might hold for the results of Study 1 in which the two dimensions of each stereotype were negatively correlated and in which unexpectedly good performances by members of one group went hand in hand with unexpectedly bad performances by members of the other group on the same dimension. Study 2 contradicted this artifactual explanation by eliminating the negative correlation between the stereotypical dimensions and by showing that the ISI Change phenomenon was asymmetrical in that it was provoked by stereotype-incongruent information about a competent target group but not by stereotype-incongruent information about an incompetent target group. If the artifactual explanation were true, the effect would probably be symmetrical.

A second artifactual explanation might be that the concurrent change in the stereotypes of the target group and the alternative group in Study 1 reflected a reduction in participants' perception of the reliability of the relevant tests. This reduction might lead participants to give more conservative score estimates (i.e. scores closer to the scale means) for both groups after viewing the stereotype-incongruent information. Again, Study 2 contradicted this explanation by showing that stereotype-incongruent information about an incompetent group did not reduce perceived test reliability to the same extent as stereotype-inconsistent information about a competent group did.

It seems, then, that the ISI Change phenomenon is a real and substantial phenomenon. To the best of our knowledge, it has not been demonstrated before. Yet it seems related to the within-stereotype dependencies that have been demonstrated in studies on the Stereotype Content Model (cf. Fiske et al., 2002; Cuddy et al., 2004; Cuddy et al., 2005; Heilman & Okimoto, 2007), and on the between group compensation effect (Kervyn, Yzerbyt, Demoulin, & Judd, 2008; Kervyn, Judd & Yzerbyt, 2009; Kervyn, Yzerbyt, & Judd, 2010).

The differential effect of stereotype-incongruent information about a competent versus an incompetent target group is consistent with the positivity – negativity asymmetry in person perception (e.g. Baumeister, Bratslavsky, Rinkenauer, & Vohs, 2001; Skowronski & Carlston, 1987, 1989; Ybarra, 2002). In general, negative information affects person perception more than positive information does. In our studies, negative stereotype-incongruent information about a target group (members of an apparently competent group performing badly) affects the alternative stereotype more strongly than positive stereotype-incongruent information about a target group does (members of an apparently incompetent group performing well).

Alternatively, the asymmetry of the ISI Change phenomenon may also be interpreted in terms of the perceived atypicality of the additional information. In the case of competences such as scientific and creative thinking bad performances by competent people may seem less atypical than good performances by incompetent people. This may be the case if people apply a hierarchically restrictive inference schema. They may then assume that highly competent individuals sometimes behave incompetently (so that an allegedly competent individual behaving incompetently is not all that strange) whereas incompetent individuals cannot behave competently (so that an allegedly incompetent individual behaving competently is strange indeed; cf. Reeder & Brewer, 1979; Tausch, Kenworthy, & Hewstone, 2007). If this reasoning is valid, then competence-suggesting information about an allegedly incompetent target group may seem more atypical than incompetence-suggesting information about an allegedly competent target group. If atypicality affects level of processing, with atypical information provoking systematic processing and not-so-atypical information provoking heuristic processing, then the stereotype-incongruent information about the incompetent group may be processed systematically—so that people correctly perceive that this information pertains to the target group only—whereas the stereotype-incongruent information about the competent group may be processed heuristically—so that people have a generalized and vague impression of the additional information being stereotype-incongruent.

Implications, limitations and future research

The prevailing view in stereotype research is that whereas stereotype-incongruent information may change stereotypes, the effect of stereotypes on information processing makes them remarkably resistant to change (e.g. Castelli, Pavan, Ferrari & Kashima,

2009; Dolderer, Mummendey & Rothermund, 2009; Sherman, Stroessner, Conrey & Azam, 2005; Vonk, 2002; Plaks, Stroessner, Dweck & Sherman, 2001; Richards & Hewstone, 2001; Kashima, 2000). The evidence for stereotypes' robustness to change is impressive. If the ISI Change phenomenon also occurs in real life stereotypes, however, this traditional view may be in need of at least some nuance.

First, the ISI Change phenomenon implies that changing the stereotype of a target group may change the stereotype of an alternative group. Second, the ISI Change phenomenon implies that stereotypes may change in the absence of directly stereotype-incongruent information. As such, it suggests that stereotypes may not in all respects be strongly resistant to change, as has often been assumed. The ISI Change phenomenon does not contradict the massive evidence for the robustness of stereotypes in the face of directly stereotype-incongruent information. However, it does reveal what may be considered at least one weak spot of at least some stereotypes in some circumstances. If the preconditions for an ISI Change phenomenon are fulfilled, stereotypes may change even in the absence of any directly stereotype-incongruent information. Third, the ISI Change phenomenon illustrates the sensibility of viewing stereotypes as representations of intergroup differences (cf. Biernat & Crandall, 1996; Campbell, 1967; Ford & Stangor, 1992; Martin, 1987; McCauley & Stitt, 1978; McCauley, Stitt, & Segal, 1980). This is especially true in those cases in which people psychologically structure the population of relevance into two mutually exclusive and exhaustive groups.

On the surface of it, one apparent limitation of our research was that the stereotype-incongruent information we presented participants with was quite massive. In most previous studies on stereotype change researchers provided participants with information about no more than a minority of group members who behaved

incongruently with the stereotype. As such, it is clear that our research is not directly comparable with previous studies. It should be noted, however, that we did not wish to show that or to which extent stereotypes can change under the influence of directly stereotype-incongruent information. Our aim was to examine whether stereotype-incongruent information induced change in a target stereotype would go hand in hand with a complementary change in an alternative stereotype. As such, it was imperative to evoke change in the former before we could even begin to examine corresponding change in the latter. Now that we have established the principle of the ISI Change phenomenon, however, in future studies we will address whether and to which extent the effect occurs when people encounter information that is less massively incongruent with a target stereotype or when they even encounter supercongruent information about that target group.

One perhaps more substantial limitation of the present research is that we used artificial stereotypes. We believe that the stereotype learning paradigm can fruitfully serve to study determinants of stereotype change. The main strength of using artificial stereotypes in research on stereotype change is that they allow to simultaneously manipulate and/or keep constant a host of stereotype characteristics, including their contents, the manner in which they are learned, their (absolute and relative) extremity and their variance. The main limitation is that the ecological validity may not be guaranteed. Artificial stereotypes are necessarily newly learned; as compared to real-life stereotypes they thus also lack the personal involvement that render people motivated to maintain them. However, various studies yielded similar results in studies on artificial groups as in studies on real-life groups (Spencer-Rodgers et al., 2007; Brückmüller & Abele, 2010), thus attesting to the ecological validity of the former. Yet in follow-up

research we will test whether the ISI Change phenomenon holds for firmly grounded and long-held stereotypes as it does for artificial and newly learned ones.

Another reason for studying the ISI Change phenomenon in naturally occurring stereotypes is to address a third limitation of our research, namely, that our participants were selected to include only those who learned the initial stereotypes to begin with. We used this strategy (rather than using a procedure in which all or most participants continued to view information until they had learned the stereotypes) in order to keep the amount of stereotype-relevant information rigorously constant over participants. Yet it leaves open the possibility that the ISI Change phenomenon only occurs in observers who are prone to form and change stereotypes. If the ISI Change phenomenon occurs for real-life stereotypes, and hence in a non-selective sample, this issue will become obsolete.

In follow-up research we will also further investigate the boundary conditions to induce indirect stereotype change. In the present studies the stereotypical characteristics always consisted of competences. We will examine if the ISI Change phenomenon also occurs in the domain of warmth and when they are negatively defined (e.g. stupid instead of intelligent). Perhaps more importantly, we will investigate the mechanisms causing the phenomenon. As a first step, we will test whether the extremity of the stereotype-incongruent information indeed influences how people process this information and whether this effect contributes to the asymmetrical nature of the ISI Change phenomenon.

Conclusion

Indirectly stereotype-incongruent information may change a perceiver's stereotype of a group if that group is complementary with the target group the information is about

and if the perceiver originally viewed that target group as superior to the former. This implies that stereotype-incongruent information about one group may change the stereotype of an alternative group. This newly demonstrated Indirect Stereotype-incongruence Induced (ISI) Change phenomenon does not contradict the general view that stereotypes are remarkably resistant to change but does suggest that under very specific circumstances, stereotypes can change in the absence of any directly stereotype-incongruent information.

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Figure 1. Test scores ratings of the target group and the alternative group on the high-test and on the low-test before versus after viewing stereotype-incongruent information about the target group.

Figure 2. Ratings on the extreme test and the average test for the competent group and the incompetent group before and after viewing stereotype-incongruent information about the competent group.

Figure 3. Ratings on the extreme test and the average test for the competent group and the incompetent group before and after viewing stereotype-incongruent information about the incompetent group.