



## Torn but balanced: Trait ambivalence is negatively related to confirmation<sup>☆</sup>

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### ABSTRACT

Traditionally, ambivalence has been conceptualized as a negative influence on decision-making (Van Harreveld et al., 2009). Challenging this notion, recent work suggests that ambivalence can be beneficial because it promotes balance in the decision-making process (Rees et al., 2013; Schneider et al., 2021). Specifically, since ambivalence is a state where contrasting sides of an attitude object (i.e., both positive and negative evaluations) are salient, it likely leads to the consideration of more diverse information, thus reducing one-sided thought. However, this research has only focused on state ambivalence. We investigated whether trait ambivalence – the individual tendency to experience ambivalence – is also related to reduced bias in thought. We examined this idea in the domain of confirmation – the tendency to prefer information in accord with one's preexisting beliefs or hypotheses while neglecting information that is not (Klayman & Ha, 1987). Using different methods, we examined the relationship between trait ambivalence and confirmation. We present five online studies (total  $N = 1306$ ) that showed that people with higher trait ambivalence showed less confirmation. This pattern was corroborated by meta-analytic evidence. Together, our work provides evidence that decision-making can benefit from trait ambivalence as it is connected to more disconfirmation.

### 1. Introduction

Modern life is complex, full of controversies and multi-faceted issues, many of which do not allow for straightforward attitudes. For instance, the refugee crisis left many citizens in Germany feeling both positive and negative (nationwide survey, Zick & Preuß, 2016). Holding such positive and negative evaluations simultaneously towards one attitude object is referred to as ambivalence (Thompson et al., 1995). People are ambivalent about a vast array of attitude objects, including political figures (Basinger & Lavine, 2005), minority groups (Maio et al., 1996), tobacco products (Hohman et al., 2016), food (Gillebaart et al., 2016), and even oneself (DeMarree et al., 2011).

Research has so far cast a bright light on the negative consequences of ambivalence for judgment and decision-making, such as biased processing and decision-delay (Clark et al., 2008; Hänze, 2001; Van

Harreveld, Rutjens, et al., 2009; Van Harreveld et al., 2009). At the same time, there is evidence that ambivalence can have positive effects on the decision-making process. For instance, ambivalence leads to increased associative breadth (Fong, 2006), higher cognitive flexibility (Rothman et al., 2017), more accurate judgments (Hostler & Berrios, 2021; Rees et al., 2013), and more awareness and effectiveness in decision-making (Guarana & Hernandez, 2016). So far, research on such positive effects of ambivalence on decision-making has focused on state ambivalence – that is, ambivalence that is experienced in the moment. However, there are also stable individual differences in people's tendency to experience ambivalence (Schneider et al., 2021; Schneider et al., 2022; Simons et al., 2018). Here, we examine whether such differences in trait ambivalence are related to decision-making. Specifically, we examine the relationship between trait ambivalence and confirmation.

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### 1.1. Confirmation and its consequences

Confirmation describes people's tendency to pay attention to, seek out, and interpret information such that it supports their already existing hypotheses (Butera et al., 2018; Klayman & Ha, 1987). People often process new information in a way that confirms an existing idea, belief, or hypothesis (Nickerson, 1998; Oswald & Grosjean, 2004) because confirmation is a form of cognitive processing that often threatens high-quality decision-making, it is often referred to as confirmation bias (Nickerson, 1998). Indeed, confirmation leads to poor decision-making in various fields, such as finance (Christandl et al., 2011; Olsen, 2008; Perera et al., 2019), science (Kaptchuk, 2003; Paap, 2014), emergency medicine (Pines, 2006), forensics (Kassin et al., 2013; O'Brien, 2009) and in crisis management during the COVID-19 pandemic (Garcia-Alamino, 2020). Confirmation also plays a role in the partisan divide: both liberals and conservatives exhibit confirmation by avoiding exposure to each other's political opinions (Frimer et al., 2017). In line with this, confirmation facilitates the formation of homogenous groups on social media, potentially adding to the rise of "fake news" and misinformation (Del Vicario et al., 2016, 2019). For example, confirmation is a contributing mechanism explaining the maintenance of misinformation about climate change (Zhou & Shen, 2021). Given the negative impact and prevalence of confirmation, it is important to identify factors associated with reduced confirmation (Garcia-Alamino, 2020; Liliensfeld et al., 2009). Drawing on insights from ambivalence research, we believe that trait ambivalence is one such factor.

### 1.2. Benefits of (trait) ambivalence on cognitive processing

So far, research has focused on how state ambivalence - that is, ambivalence experienced in the moment - affects cognitive processing (Clark et al., 2008; Fong, 2006; Rees et al., 2013; Sawicki et al., 2013; Van Harreveld, Rutjens, et al., 2009). For example, research has shown that state ambivalence leads to positive consequences on decision-making, suggesting that it broadens cognitive processing. In a study on creativity, people who wrote about an ambivalent situation in their lives found more unusual connections across different word sets compared to people who wrote about a non-ambivalent life event (Fong, 2006). State ambivalence can also increase judgment accuracy. Particularly, state ambivalence leads to a greater openness to other perspectives before when making a judgment - thereby increasing judgment accuracy (Rees et al., 2013): People who felt ambivalent were more interested in and considerate of advice given by others (i.e., alternative perspectives) compared to people who were in a non-ambivalent state leading to greater judgment accuracy concerning college tuition estimations (Rees et al., 2013).

Recent work suggests that people's trait ambivalence - that is, people's general tendency to experience ambivalence more often and about more things - is also connected to broader cognitive processing (Schneider et al., 2021). This research showed that people with a higher trait ambivalence show less cognitive bias in their judgments of others (Schneider et al., 2021). Specifically, this work looked at correspondence bias which describes the tendency to see others' behavior more as the result of dispositional factors rather than situational influences (Gilbert & Malone, 1995). So, when people observe someone's behavior, they tend to attribute that behavior (i.e., being late to a meeting) more strongly to dispositional factors (i.e., being a poor planner) than situational factors (i.e., traffic jams or family emergency). People with higher trait ambivalence tend to attribute a person's actions as strongly to dispositional factors (i.e., character traits) as those with low trait ambivalence, but also strongly to the environment's features (i.e., social norms), therefore considering both causes (Schneider et al., 2021).

Although the work by Schneider et al. (2021) did not look at decision-processes per se, their results showing that higher trait ambivalence is connected to considering distinctive kinds of information (i.e., external and internal causes of another's behavior) suggest that

people with higher trait ambivalence process information more broadly. As such, people with higher trait ambivalence might also be more balanced when considering both confirmatory and dis-confirmatory information - thus showing less confirmation.

## 2. Research overview

We present five studies that systematically tested the hypothesis that trait ambivalence is negatively connected to confirmation. As a first step, we investigated whether trait ambivalence was related to the degree to which people use confirmatory strategies when testing assumptions. Thus, in Study 1A and 1B, we measured confirmation using several short decision tasks where participants read brief scenarios and could choose among confirmatory or disconfirmatory ways to test assumptions made in the scenarios (Rassin, 2008). In Study 2A and 2B, we used the well-established Trait Hypothesis Testing Task (Snyder & Swann, 1978). With this paradigm, we examined how people would acquire information to test a hypothesis (Klayman & Ha, 1987) - and how this relates to trait ambivalence. We also added a state ambivalence manipulation to Study 2A to examine whether this affects confirmatory hypothesis testing as suggested by previous research (Rees et al., 2013). Study 2B offers a replication of Study 2A. Finally, in Study 3, we examined how people evaluated confirmatory and disconfirmatory information presented to them. In all studies, we measured trait ambivalence using the Trait Ambivalence Scale (Schneider et al., 2021). This scale has shown good internal and temporal consistency as well as acceptable factor loadings (Schneider et al., 2022, 2021). Additionally, higher scores on the Trait Ambivalence Scale were positively related to the degree of state ambivalence (objective and subjective) people experienced towards a variety of attitude objects (Schneider et al., 2022).

To estimate the robustness of our findings, we present a meta-analysis across all studies (including three additional studies in this project that are reported supplementary materials). For each *p*-value reported in this paper, we include whether the associated significance test was one-tailed or two-tailed. In case of a directional hypothesis, we report the one-tailed significance level whereas when there was no directional hypothesis, or the analysis was exploratory, we report the two-tailed significance level. Analyses scripts, data sets, and materials for all studies can be found here: <https://osf.io/z3t65/>. All data were analyzed using RStudio, version 1.4.1106 (RStudio Team, 2021).

## 3. Study 1A and 1B

Study 1A was a first test of the relationship between trait ambivalence and confirmation. Study 1B was a close replication of Study 1A with minor modifications for exploratory purposes. Study 1B received ethics approval granted by the faculty's ethics commission.

### 3.1. Method

#### 3.1.1. Participants and design

One hundred and fifty participants participated in Study 1A. Participants were recruited via Amazon Mechanical Turk. Since it was essential for the validity of the results that participants understood the task's instructions, we excluded two non-native English speakers. We excluded five participants because they indicated that they were familiar with at least one of the decision tasks. The final dataset for study 1A consisted of 143 participants ( $M_{age} = 36.15$ ,  $SD_{age} = 11.41$ , 70 male, 72 female, 1 other). For Study 1B, we recruited 264 participants via the recruiting platform Amazon Mechanical Turk. We excluded nine non-native English speakers. The final data set of Study 1B thus consisted of 255 participants ( $M_{age} = 34.92$ ,  $SD_{age} = 10.93$ , 134 male, 118 female, three other). Study 1A and 1B followed the same main design. However, we made small modifications to Study 1B, described in detail below.

Study 1A was not preregistered. The preregistration for Study 1B can

be found here: [https://aspredicted.org/QZE\\_QFQ](https://aspredicted.org/QZE_QFQ). The sample size for Study 1B was based on a conservative adjustment of the effect size found in Study 1A of  $r = 0.20$ . This effect size is comparable to the effects found for the relationship between trait ambivalence and bias in person perception (Schneider et al., 2021). A power analysis using  $g^*$ power (Faul et al., 2009) with the respective effect size parameters:  $r = 0.2$ ,  $\alpha$  level = 0.05, and power = 0.95 produced a required sample size of 262. Also, a sample size in this range (about 250 participants) would be needed to obtain stable correlation estimates (Schönbrodt & Perugini, 2013).

### 3.1.2. Procedure and materials

Participants provided informed consent and then read a short study introduction saying that the study dealt with decision-making behavior. After this, participants were sequentially presented with five short decision tasks to measure confirmation (Rassin, 2008). In each task, a decision scenario was described where participants were asked to test an initial hypothesis (e.g., that a number sequence follows a certain rule). For each task, there were several answer options. The answer options were either biased towards confirming the initial hypothesis or not. All decision tasks and respective answer options, as well as their scoring, can be found in the supplemental materials. To create an overall confirmation score, we coded each case where a participant chose a confirmatory answer as “1” and each instance where a disconfirming answer was selected as “0”. Our main dependent variable in both Study 1A and 1B was the sum of these codings and could range from zero to five, where higher scores indicated more confirmation. Study 1B also included a sixth decision task for exploratory purposes. This was a modified Wason’s Card Selection Task, where the scenario was embedded in a social context, which is easier to solve for participants (Griggs & Cox, 1982). As this item is not directly relevant to our focal research question, we report the analyses that include this exploratory item in the supplemental materials.

Next, we measured trait ambivalence. For this, participants filled out the Trait Ambivalence Scale (Schneider et al., 2021; Cronbach’s  $\alpha$  Study 1A = 0.94; Cronbach’s  $\alpha$  Study 1B = 0.91) that consists of 10 items (e.g., “I often feel torn between two sides of an issue”, all items can be found in the supplemental materials). Participants stated their agreement on a 7-point Likert scale, ranging from 1 (does not apply to me at all) to 7 (strongly applies to me), with higher scores indicating higher trait ambivalence. Trait ambivalence was computed as the average of all items, with higher scores indicating higher trait ambivalence.

Additionally, we assessed individual differences in confirmation in Study 1A with the Confirmation Inventory (Rassin, 2008). The order of this scale and the Trait Ambivalence Scale was counterbalanced in Study 1A. As this scale was not relevant for the focal research question, the analysis concerning this scale can be found in the supplemental materials, and it was not included in Study 1B. Lastly, participants indicated gender, age, native language, and comments. After completion, participants were thanked and debriefed.

## 3.2. Results

### 3.2.1. Results and discussion Study 1A (exploratory)

On average, participants had a confirmation score of 3.83 ( $SD = 1.01$ ). The average trait ambivalence was 3.91 ( $SD = 1.38$ ). We conducted a Spearman rank correlation to test our hypothesis because the confirmation score was not normally distributed,  $W = 8.52$ ,  $p < .0001$  (one-tailed). In line with our expectation, trait ambivalence was significantly negatively associated with confirmation,  $r_s = -0.34$ ,  $p < .001$  (two-tailed), 95% CI  $[-0.48, -0.18]$ . Thus, the higher individuals’ trait ambivalence, the less confirmation they showed in the decision tasks.

### 3.2.2. Results and discussion Study 1B (confirmatory)

On average, participants had a confirmation score of 3.81 ( $SD = 0.96$ ). The average trait ambivalence was 4.2 ( $SD = 1.22$ ). Since the

confirmation score was not normally distributed,  $W = 8.68$ ,  $p < .0001$  (one-tailed), we conducted the correlational analysis with Spearman rank correlations. Trait ambivalence was significantly negatively associated with the confirmation score,  $r_s = -0.11$ ,  $p = .048$  (one-tailed), 95% CI  $[-0.23, 0.02]$ .

In both Study 1A and 1B, we found a negative relationship between trait ambivalence and confirmation: the higher people were in trait ambivalence, the less confirmation they showed across decision tasks.

## 4. Study 2A and 2B

In Study 2A and 2B, we investigated the relationship between trait (and state) ambivalence and confirmatory hypothesis testing (Klayman, 1995). People often tend to test whether an idea or a hypothesis is true by generating confirming information rather than looking for information that would falsify it (Klayman & Ha, 1987; Snyder & White, 1981). For example, if people met someone new at work and they were trying to determine whether this person is extroverted or not, they would be more likely to look for traits that confirm this extroversion hypothesis (e.g., it is easy for the person to strike up conversations with basically anybody in the office) instead of testing its truth value by looking for falsifying information (e.g., this person often spends their lunch break reading).

To examine confirmatory hypothesis testing in Study 2A and 2B, we used the Trait Hypothesis Testing Task (Snyder & Swann, 1978). The Trait Hypothesis Testing Task captures people’s tendency to test a focal hypothesis that a person is extraverted in a confirmatory way (i.e., select more confirmatory vs. disconfirmatory questions). This paradigm focuses on information gathering strategies as a component of confirmatory hypothesis testing (Klayman, 1995) and recently showed good reliability (Berthet, 2021). In this task, people are asked to imagine themselves in an interview situation where their goal is to test the assumption of whether another person is extroverted (i.e., their initial hypothesis). To do this, people can choose questions they would want to ask this person. People can choose from a list with confirmatory questions – these questions could confirm that the person is indeed extraverted (e.g., “What would you do if you wanted to liven things up at a party?”), disconfirmatory – these questions could disconfirm that the person is extraverted (e.g., “In what situations do you wish you could be more outgoing?”), or neutral (e.g., “What activities do you really excel in?”) questions.

Following an approach similar to Study 1A and 1B, we examined in Study 2A whether trait ambivalence was related to confirmatory hypothesis testing, and in Study 2B, we then confirmed the correlational findings through a replication. Finally, we also examined the effect of state ambivalence on these processes by including a manipulation of state ambivalence in Study 2A. Studies 2A and 2B received ethics approval granted by the faculty’s ethics commission.

### 4.1. Method

#### 4.1.1. Participants and design

In Study 2A, four hundred and twenty participants participated. Participants were recruited via Amazon Mechanical Turk. In line with our exclusion criteria in the preregistration, we excluded nine non-native English speakers. To ensure that participants understood the instructions for our ambivalence manipulation, we checked their understanding of what ambivalence was. Fourteen participants in the ambivalence condition thought ambivalence meant not knowing much about a topic, and 18 participants thought it meant not caring about a topic. These participants were excluded. These exclusions resulted in an  $N$  of 379 ( $M_{age} = 37.09$ ,  $SD_{age} = 10.95$ , 209 male, 168 female, 2 other) for final data analysis.

In Study 2B, two hundred and sixty-one participants participated. Participants were recruited via Prolific. As we used an active pre-screening filter for native language “English” on Prolific, we did not need to exclude anyone based on this criterion. Therefore, we had a final

N of 261 ( $M_{age} = 32.48$ ,  $SD_{age} = 10.98$ , 101 male, 158 female, 2 other).

The preregistrations for Studies 2A and 2B can be found here <https://aspredicted.org/blind.php?x=9fz9re> and here <https://aspredicted.org/blind.php?x=sh4cf7>, respectively. Please note that the relationship between trait ambivalence and confirmatory hypothesis testing was pre-registered in Study 2B but not in Study 2A. The sample size of Study 2A was determined based on the effect sizes for the relationship between trait ambivalence and confirmation found in Study 1A ( $r_s = -0.3$ ; Cohen's  $d = 0.63$ ) and 1B ( $r_s = -0.11$ ; Cohen's  $d = 0.2$ ). The computed average Cohen's  $d$  was 0.42. Because the effect of this relationship might have been inflated - in Study 1B, we found a Spearman's rho of  $-0.11$  - we, therefore, assumed a smaller effect size of Cohen's  $d = 0.25$ . A power analysis (Faul et al., 2009) with this effect size, an  $\alpha$  level of 0.05, and a power of 0.80 yielded a sample size of 398. Additionally, to ensure that we would have enough usable data points, we included a data discard rate of 0.05 in our sample size calculation. Therefore, the total sample to collect amounted to 419 participants in Study 2A. To calculate the needed sample for Study 2B, we assumed a small effect size (Cohen's  $d = 0.4$ ). Power analysis with this effect size as well as an  $\alpha$  level of 0.05 and a power of 0.95 resulted in a sample size of 262.

#### 4.1.2. Procedure and materials

First, participants provided informed consent and read a short study introduction telling participants that the study was about how people find out information about others. After this, in Study 2A, they were randomly assigned to one of two conditions of the state ambivalence manipulation where we asked half of the participants to write about an ambivalent topic and the other half to write about a non-ambivalent topic (cf. van Harreveld et al., 2014; see supplemental materials for full task description).

Participants in Study 2A then went on directly to complete the paradigm to capture confirmatory hypothesis testing - namely, the Trait Hypothesis Testing Task (Snyder & Swann, 1978; see supplemental materials for the complete task). In this paradigm, participants are told that their task is to find out whether a person they just met is extroverted or not and read the following instructions: "On the next page you will read a general personality profile. Imagine that you are about to interview a person you don't know, and you want to find out if this person matches the personality profile. Which questions would you ask? Participants then read a short description describing a typical extroverted person. After this, participants were provided with a list of 26 (25 in Study 2B) questions to find out whether the person is extroverted or not (11<sup>1</sup> hypothesis-confirming questions, e.g., "What do you like about parties?"; 10 hypothesis-disconfirming questions, e.g., "What factors make it hard for you to open up to people?"; 5 neutral questions, e.g., "What are your career goals?"). Participants were asked to select 12 questions on this list that they would ask the other person to find out if the person is an extrovert. As a proxy of our dependent variable confirmatory hypothesis testing, we calculated a difference score where we subtracted the number of selected hypothesis-disconfirming questions from the number of selected hypothesis-confirming questions. Therefore, higher scores indicated a greater tendency towards confirmation in hypothesis testing. After completing the Trait Hypothesis Testing Task, participants in Study 2A filled out the Trait Ambivalence Scale to measure trait ambivalence levels (Schneider et al., 2021; Study 2A: Cronbach's  $\alpha = 0.92$ ).

Next, participants in Study 2A completed the manipulation check for which we measured subjective ambivalence (Priester & Petty, 1996) and objective ambivalence (Thompson et al., 1995) that people experienced towards the topic they wrote about in the manipulation procedure (see the supplemental materials for a more detailed description of the

<sup>1</sup> For Study 2B, we removed one confirmatory question to have an equal number of confirmatory and dis-confirmatory questions to select from (see the supplemental materials for a full list of the questions).

manipulation check). As half of the participants in Study 2A were asked to write about a topic they felt ambivalent about, we included a control question of whether participants in this condition knew what "ambivalence" meant. The item read "What, in your mind, does it mean to be ambivalent?". Participants could select one of three answers: "That you don't really know much about a topic.", "That you have strong feelings, both negative and positive, and that you feel conflicted about the topic." or "That you don't care about the topic.". Participants in the ambivalence condition (i.e., who were asked to write about an ambivalent topic) who did not select the second (i.e., the correct) answer were excluded.

In Study 2B, where there was no manipulation procedure, the order of the Trait Ambivalence Scale (Schneider et al., 2021; Study 2B: Cronbach's  $\alpha = 0.91$ ) and the Trait Hypothesis Testing task was counterbalanced. Participants in both Study 2A and 2B concluded the studies by answering demographic questions (e.g., gender, age, native language). On the last page before completion, participants received a full debrief.

## 4.2. Results

### 4.2.1. State ambivalence (Study 2A only)

**4.2.1.1. Manipulation check.** Participants in the ambivalence condition had significantly higher scores of objective ambivalence ( $M = 8.36$ ,  $SD = 2.69$ ) than participants in the non-ambivalence condition ( $M = 4.11$ ,  $SD = 3.91$ ),  $t(372.64) = 12.51$ ,  $p < .0001$  (one-tailed), Cohen's  $d = 1.24$ , 95% CI [3.58, 4.91]. This was also the case for subjective ambivalence ( $M = 7.56$ ,  $SD = 2.22$  vs.  $M = 3.65$ ,  $SD = 3.13$ ),  $t(374.46) = 14.25$ ,  $p < .0001$  (one-tailed), Cohen's  $d = 1.41$ , 95% CI [3.37, 4.45]. This suggests that the manipulation of state ambivalence was successful.

**4.2.1.2. Main analysis.** The difference score (i.e., number of selected confirmatory questions - number of selected disconfirmatory questions) was not normally distributed ( $W = 0.97$ ,  $p < .0001$ ). Therefore, we ran a Wilcoxon rank-sum test with continuity correction to test our preregistered hypothesis: the difference score in the ambivalence condition ( $Mdn = 4.00$ ) did not differ significantly from the non-ambivalence condition ( $Mdn = 3.00$ ),  $W = 18,874$ ,  $p = .438$  (one-tailed),  $r = -0.008$ . This means that the manipulation did not significantly affect how much confirmation people showed in their hypothesis testing.

### 4.2.2. Trait ambivalence (Study 2A and 2B)

**4.2.2.1. Study 2A (exploratory).** Mean trait ambivalence was 4.09 ( $SD = 1.27$ ). Trait ambivalence was negatively associated with the number of selected confirmatory questions ( $r_s = -0.33$ ,  $p < .0001$  (two-tailed), 95% CI [-0.41, -0.23]), indicating that with higher trait ambivalence, participants tended to select fewer confirmatory questions. Moreover, trait ambivalence levels were also negative correlated with the difference score,  $r_s = -0.28$ ,  $p < .0001$  (two-tailed), 95% CI [-0.38, -0.19]). These results, therefore, conceptually replicate the findings of Study 1A and 1B, where we also found a negative relationship between trait ambivalence and confirmation bias.

**4.2.2.2. Study 2B (confirmatory and exploratory).** Mean trait ambivalence was 4.18 ( $SD = 1.17$ ). For Study 2B, based on literature using the Trait Hypothesis Testing Task (Berthet, 2021; Kleiman & Hassin, 2013), we preregistered the number of selected confirmatory questions as the dependent variable. The number of selected confirmatory questions was not normally distributed ( $W = 0.94$ ,  $p < .0001$ ). For this reason, we used Spearman correlations for our confirmatory analysis. It revealed that trait ambivalence was significantly negatively associated with the number of selected confirmatory questions ( $r_s = -0.19$ ,  $p < .01$  (one-tailed), 95% CI [0.31, -0.07]), meaning that the higher trait ambivalence participants had, the fewer confirmatory question they selected.

Concerning the exploratory analysis, the same pattern was observed when looking at the correlation between trait ambivalence and difference score (the preregistered dependent variable in Study2A):  $r_s = -0.15, p = .015$  (two-tailed), 95% CI [-0.27, -0.03]. The results are consistent with what we found in Study 2A and conceptually consistent with the results of Studies 1A and 1B.

4.2.3. *Confirmatory hypothesis testing and trait ambivalence: combined results over study 2A and 2B*

To better assess the consistency of all our findings concerning confirmatory hypothesis testing and trait ambivalence, we created a comprehensive overview of the results (see Table 1). For this overview, we present the correlational result in two categories: (1) per single number of selected confirmatory and disconfirmatory questions and (2) in difference scores. In the second category, we put the selection of confirmatory vs. disconfirmatory questions in direct contrast by calculating a difference score where we subtracted the number of selected disconfirmatory questions from the number of selected confirmatory questions. Further, we also calculated the absolute difference score: perfect balance would then be a score of 0, and higher scores would indicate higher imbalance. Using this score with the absolute difference, we cannot tell whether the deviation – or imbalance – is because more confirmatory than disconfirmatory questions were selected or vice versa. Finally, we present the weighted score and its correlations with trait ambivalence, where we divided the difference score by the sum of selected confirmatory and disconfirmatory questions.

The correlations between trait ambivalence and the number of selected confirmatory questions across all three studies reveal a consistent pattern of negative association. Combined, the results of all two studies show that the higher the trait ambivalence levels, the fewer confirmatory questions participants selected. The correlational results concerning trait ambivalence and the selection of disconfirmatory questions showed positive relationships. Hence, participants with higher trait ambivalence selected not only fewer confirmatory questions but also more disconfirmatory ones. Although the pattern for the selection of disconfirmatory questions is not quite as consistent as we did not find a significant correlation in Study 2B, the direction of all three correlations is the same. Moreover, there were consistent negative correlations concerning all difference scores in all three studies. This indicates that while participants with higher ambivalence selected more disconfirmatory than confirmatory questions, the difference between the number of selected confirmatory and disconfirmatory questions tended to be smaller at higher trait ambivalence levels. Also, the correlation with the weighted difference score showed that participants higher in trait ambivalence selected more disconfirmatory than confirmatory questions.

The results presented in Table 1 show that how people go about gathering information differs as a function of trait ambivalence: people with higher trait ambivalence set out to acquire information using fewer confirmatory questions. However, it remains unclear how people would respond to actual information based on their trait ambivalence levels. In

other words, how would people with different trait ambivalence levels evaluate confirmatory and disconfirmatory information? In Study 3, we aimed to shed light on this question by exploring how trait ambivalence relates to how confirmatory versus disconfirmatory information is evaluated.

5. Study 3

As the decision-making process requires not only the acquiring of information but also the handling and evaluation of actual information, we set out to examine how people evaluate information in the decision-making process as a function of their trait ambivalence levels. To do this, we drew upon a well-established paradigm used in confirmation research (Frey & Rosch, 1984; Jonas et al., 2003). In this paradigm, participants read a decision scenario about whether or not to extend a store manages contract. After making a preliminary decision about the contract extension, participants are presented with information pieces that are either in line with (i.e., confirmatory) or speaking against (i.e., disconfirmatory) contract extension. Typically, three confirmation variables are of interest in this paradigm: how credible and important do people find each piece of information and whether people would like to learn more about the different pieces of information.

Based on our results so far that show higher trait ambivalence is related to less confirmation, we predicted that with higher trait ambivalence, people would show less interest in learning more about confirmatory information in contrast to disconfirmatory information. Likewise, we examined the relationship between state ambivalence and interest. We also looked at the evaluation of confirmatory and disconfirmatory information and how the evaluation bias score was related to trait ambivalence levels and state ambivalence.

5.1. Method

5.1.1. Participants and design

Three hundred and twenty-four participants were recruited from an online participant pool at the Social Cognition Center of the University of Cologne. We only included participants whose preliminary and final decisions were identical in order to clearly identify pro and con decision-makers to validly distinguish between confirmatory and disconfirmatory information (see Frey & Rosch, 1984). Accordingly, fifty-six participants were excluded. As we ran this exact study as a pilot, we excluded any participants who participated in this pilot based on a self-generated anonymous participant code. This led us to exclude three participants. Additionally, we excluded all participant code duplicates in the current sample ( $N = 12$ ). The final dataset for Study 3 consisted of 268 participants ( $M_{age} = 26.13, SD_{age} = 9.35, 59$  male, 203 female, four other, and two rather did not say). The preregistration for Study 3 can be found here: <https://aspredicted.org/blind.php?x=5xt69s>. The sample size of Study 3 was determined based on a small to medium effect (Cohen's  $d = 0.415$ ). A power analysis using  $g^*$ power (Faul et al., 2009) with this effect size and an  $\alpha$  level of 0.05 and a power of 0.80 yielded a required

**Table 1**  
Correlations between trait ambivalence and confirmatory hypothesis testing variables of Studies 2A and 2B.

Study	Correlations per question type		Correlation with difference scores (confirmatory – disconfirmatory)		
	$r(TA, CQ)$	$r(TA, DQ)$	$r(TA, \text{raw difference score})$	$r(TA, \text{absolute difference score})$	$r(TA, \text{weighted difference score})$
Study 2A ( $N = 379$ )	$-0.33^{***}$ [-0.41;-0.24]	$0.22^{***}$ [0.13;0.30]	$-0.28^{***}$ [-0.37;-0.20]	$-0.26^{***}$ [-0.34;-0.17]	$-0.27^{***}$ [-0.35;-0.18]
Study 2B ( $N = 266$ )	$-0.19^{**}$ [-0.31;-0.06]	$0.10$ [-0.02;0.22]	$-0.15^*$ [-0.27;-0.03]	$-0.15^*$ [-0.27;-0.03]	$-0.14^*$ [-0.25;-0.02]

Note. TA = trait ambivalence, CQ = Number of confirmatory questions, DQ = Number of disconfirmatory questions. All correlations are Spearman correlations because the confirmatory hypothesis testing scores were not normally distributed. Numbers in square brackets represent the 95% confidence interval [Lower limit; Upper limit].

$^{***} p < .001.$   
 $^{**} p < .01.$   
 $^* p < .05.$

sample size of 262.

### 5.1.2. Procedure and materials

First, participants provided informed consent and then read a short study description telling participants that the study dealt with decision-making tasks. The order of the selective exposure task and Trait Ambivalence Scale was counterbalanced, so half of the participants continued by filling out the Trait Ambivalence Scale (Schneider et al., 2021; Cronbach's  $\alpha = 0.91$ ) and the other half with the selective exposure task.

In the selective exposure task (Frey & Rosch, 1984; Jonas et al., 2003), participants read a scenario about the decision of whether Mr. Müller's employment contract should be extended or not. Participants were presented with a text describing Mr. Müller, a department store manager at a fictional department store. This description included information about Mr. Müller's general tasks and performance and concluded with the summary that under his management, there have been neither significant gains nor significant losses (see supplemental materials for an English translation of the entire introductory text). After this, participants were asked to make a preliminary decision: "Please imagine you have to make a preliminary decision now: Should Mr. Müller's employment contract be extended?" Participants could answer either "Yes" or "No".

Participants then responded to several more items concerning their preliminary decision. Two of these were used to calculate state ambivalence "How much would you like Mr. Müller's contract to be extended?" and "How much would you not like Mr. Müller's contract to be extended?", for both there was a 10-point scale, ranging from "not at all" to "very much". For the final state ambivalence score, both ratings were submitted to the following formula:  $((P + N)/2) - |P - N|$ ; with P referring to the score on the "How much would you like Mr. Müller's contract to be extended?"- item and N referring to the score on the "How much would you not like Mr. Müller's contract to be extended?"- item (Thompson et al., 1995). Additionally, as part of the standard selective exposure paradigm, we assessed decision certainty with eight items (Fischer et al., 2010; Jonas et al., 2003). As they are not relevant to the current research question, we are not reporting any analyses with these items.

After this, participants were told that they would be presented with additional information concerning the decision in the form of short statements by industry experts. Participants sequentially read the 12 experts' statements (see all statements in the supplemental materials) in randomized order and for each were asked to answer the following three questions: "How credible do you consider this argument?" (10-point scale, from "not at all credible" to "very credible"), "How important do you consider this argument?" (10-point scale, from "not at all important" to "very important"), and "Would you read the associated article?" ("Yes" or "No"). Participants were asked to make a final decision: "Please imagine you have to make a final decision now: Should Mr. Müller's employment contract be extended?" Participants could answer either "Yes" or "No".

To create our main dependent variable – the confirmatory interest score, we subtracted the number of saying "Yes" to read more of the disconfirmatory statements from the number of saying "Yes" to read more of the confirmatory statements. As such, the higher this score, the greater the interest in learning more about confirmatory information in contrast to disconfirmatory information. For the evaluation bias score, we first created difference scores: we subtracted the mean importance rating of disconfirmatory statements from the mean importance ratings of the confirmatory statements and did the same with the credibility statements. Given that both difference scores were highly correlated, we collapsed both scores into one, creating the evaluation bias score. This way, the higher the evaluation bias score, the more favorable (i.e., important and credible) confirmatory information was evaluated as compared to disconfirmatory information.

Lastly, some demographic questions (e.g., gender, age, native language, comments) followed, and upon completion, participants were thanked and debriefed on the last page of the survey.

## 5.2. Results

### 5.2.1. Confirmatory analysis

To test our main hypotheses that there is a negative association between the confirmatory interest score and trait as well as state ambivalence, we conducted multiple linear regression analyses that included the confirmatory interest score as the dependent variable and trait ambivalence as well as state ambivalence as predictors (see Table 2). For the analysis, both predictors were centered on their respective mean. The results of the multiple regression analyses show that neither trait ambivalence ( $b = -0.13$ ,  $t(265) = -1.51$ ,  $p = .065$  (one-tailed)) nor state ambivalence ( $b = -0.05$ ,  $t(265) = -1.30$ ,  $p = .098$  (one-tailed)) was significant predictors of the confirmatory interest score. This suggests no meaningful relationship between trait ambivalence and how much interest people showed in wanting to learn about confirmatory versus disconfirmatory information. The same was true for state ambivalence.

### 5.2.2. Exploratory analysis

We conducted multiple regression analyses to investigate whether trait ambivalence and state ambivalence predict the evaluation bias score between ratings of confirmatory and disconfirmatory statements as the dependent variable. The raw difference was calculated by subtracting the average importance ratings of the disconfirmatory information from the average importance ratings of the confirmatory information. We did the same for the credibility ratings. Due to their high correlation ( $r = 0.84$ ,  $p < .0001$ ) and same scaling properties, we collapsed the raw difference scores for importance and credibility ratings into one evaluation bias score. The multiple regression analysis revealed that both trait ambivalence,  $b = -0.21$ ,  $t(265) = -2.60$ ,  $p < .01$  (two-tailed), and state ambivalence,  $b = -0.22$ ,  $t(265) = -6.09$ ,  $p < .0001$  (two-tailed), were significant predictors of the evaluation bias score (see Table 3). Therefore, both higher trait and state ambivalence were related to a smaller evaluation bias. In other words, the higher participants were in both trait and state ambivalence, the more relative importance and credibility they assigned to disconfirmatory information over confirmatory information.

## 5.3. Discussion

Neither trait ambivalence nor state ambivalence was connected to people's interest in confirmatory versus disconfirmatory information. However, in our exploratory analysis, we found that higher trait ambivalence was negatively related to the evaluation bias score. This means that the higher the trait ambivalence levels, the smaller the bias to evaluate confirmatory information more favorably than disconfirmatory information, suggesting that people with higher trait ambivalence showed less confirmation in how they valued different types of information. In addition, we found the same pattern of results for state ambivalence: The higher state ambivalence, the less confirmation people showed in terms of information evaluation (i.e., less evaluation bias).

## 6. Meta-analysis across all studies

To determine the overall effect size of the relationship between trait ambivalence and confirmation, we performed a meta-analysis across all studies done in this project. This analysis allows us to draw a more comprehensive and precise conclusion concerning the overall effect and increases transparency because null findings can be included as well (Goh et al., 2016). In our meta-analysis, we included all studies that are presented in the paper (Studies 1A, 1B, 2A, 2B, and 3) as well as three studies reported in the supplemental materials where we either did not find a significant relationship and/or had only small sample sizes (Supplemental Studies 1, 2, and 3), resulting in 8 studies.

In all three supplemental studies, we included the Trait Ambivalence

**Table 2**  
Regression results using the confirmatory interest score as the criterion.

Predictor	<i>b</i>	<i>b</i> 95% CI	<i>beta</i>	<i>beta</i> 95% CI	<i>r</i>	Fit
(Intercept)	0.58**	[0.39, 0.77]				
Trait ambivalence	-0.13	[-0.29, 0.04]	-0.09	[-0.17, 0.07]	-0.10	
State ambivalence	-0.05	[-0.12, 0.03]	-0.08	[-0.22, 0.01]	-0.09	
						$R^2 = 0.016$ ; 95% CI[0.00,0.05]

Note. Square brackets indicate the 95% confidence interval [LL, UL].  
\*\*  $p < .01$ .

**Table 3**  
Regression results using the collapsed raw difference scores of importance and credibility as the criterion.

Predictor	<i>b</i>	<i>b</i> 95% CI	<i>beta</i>	<i>beta</i> 95% CI	<i>r</i>	Fit
(Intercept)	1.02**	[0.84, 1.21]				
Trait ambivalence	-0.21**	[-0.37, -0.05]	-0.15	[-0.26, -0.04]	-0.18**	
State ambivalence	-0.22**	[-0.29, -0.15]	-0.35	[-0.46, -0.23]	-0.36**	
						$R^2 = 0.15^{**}$ ; 95% CI[0.08,0.23]

Note. Square brackets indicate the 95% confidence interval [LL, UL].  
\*\*  $p < .01$ .

Scale (Schneider et al., 2021). In Supplemental Study 1 and 2, we used the same decision tasks as in Study 1A and 1B to capture confirmation, while in Supplemental Study 3, we used the Trait Hypothesis Testing Task (Snyder & Swann, 1978) to assess confirmatory hypothesis testing. In contrast to the studies presented in the main text, the Supplemental Studies 1, 2, and 3 are not fully powered studies (for a more detailed description of the methods and results of these studies, see the supplemental materials). By including all studies of the project line, instead of selectively presenting studies, we increase the validity of our meta-analysis to closer represent the “true” size of the relationship between trait ambivalence and confirmation (Vosgerau et al., 2019).

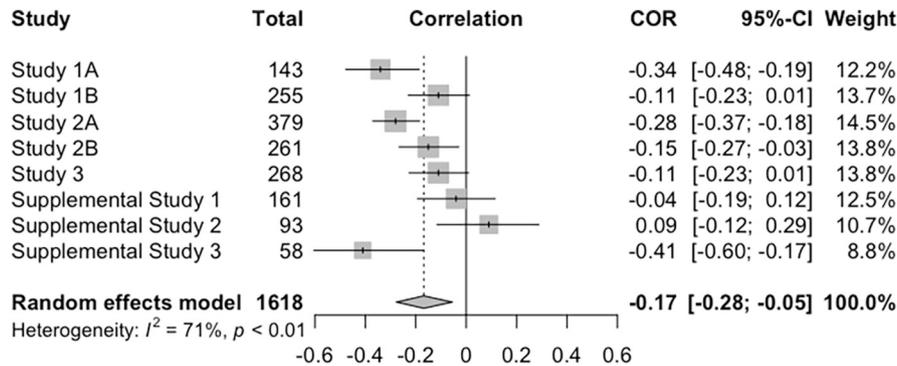
For Study 1A, 1B as well as Supplemental Studies 1 and 2, we used the correlation between trait ambivalence and the overall confirmation score as input for the meta-analysis. For Studies 2A, 2B, and Supplemental Study 3, we used the correlation coefficients between trait ambivalence and the raw difference scores (i.e., subtracting the number of selected disconfirmatory questions from the number of selected confirmatory questions). This approach made the correlation coefficients of Studies 2A, 2B, and Supplemental Study 3 more comparable with those of Study 3. For Study 3, we took the average of the two correlations: first, the correlation between trait ambivalence and the collapsed importance and credibility difference score and second, the correlation between trait ambivalence and the interest difference score ( $r_s = -0.11$ ). As we used different measurements of confirmation across studies, we used a random-effects model with restricted maximum likelihood estimation. We also specified that for the analysis, all correlations were Fisher-z-transformed. In line with our overall hypothesis,

the meta-analysis revealed an overall estimated negative correlation between trait ambivalence and confirmation,  $r = -0.17$ ,  $z = -2.88$ ,  $p < .01$ , 95%CI [-0.28; -0.05] (see Fig. 1). Thus, the combined results of all eight studies show that people with higher trait ambivalence levels show less confirmation.

**7. General discussion**

A growing body of work suggests that state ambivalence can have positive consequences (Cavazza & Butera, 2008; Fong, 2006; Guarana & Hernandez, 2016; Hostler & Berrios, 2021; Pillaud et al., 2018; Rees et al., 2013; Schneider et al., 2021). We extend these findings to trait ambivalence into the domain of confirmation. Confirmation describes people's tendency to pay attention to and interpret information in a way that corroborates an already existing hypothesis or belief, rather than trying to falsify it by considering alternative hypotheses (Butera et al., 2018; Klayman & Ha, 1987; Oswald & Grosjean, 2004). We hypothesized that trait ambivalence is negatively related to confirmation. The results of five studies, focusing on different aspects of confirmation, supported our hypothesis.

First, higher trait ambivalence was related to selecting fewer confirmatory answers (Study 1A and 1B). This same tendency emerged when we asked people how they would acquire information to test a hypothesis (Study 2A and 2B): people higher in trait ambivalence consistently chose fewer hypothesis-confirming questions. Moreover, trait ambivalence was also related to how people evaluated information. Specifically, the higher their trait ambivalence, the smaller people's



**Fig. 1.** Forest plot of meta-analytic results of the relationship between trait ambivalence and confirmation bias. The squares represent the individual effect sizes, and its size indicates the weight with which it enters the overall effect size, under “Weight” this is indicated as percentage per study. The diamond represents the overall effect size across all studies. The width of the diamond represents the 95% confidence interval.

evaluative bias towards confirmatory information. Instead, people with higher trait ambivalence tended to evaluate disconfirmatory information as more important and credible than confirmatory information (Study 3). The replicability of our findings is corroborated by a meta-analysis that included all studies presented in the main text and three additional studies reported in the supplemental materials. This meta-analysis showed an overall negative relationship between trait ambivalence and confirmation across studies and offers a more precise estimate of the effect size. Our results are further strengthened by using different decision tasks, thereby covering different facets of confirmation (e.g., Brunswik, 1947, 1955; for similar reasoning see Urschler et al., 2019).

While the relationship between trait ambivalence and confirmation was consistent across studies, our findings related to state ambivalence were more difficult to interpret. Previous research has found positive effects of unrelated state ambivalence (Rees et al., 2013), that is, an effect of experiencing ambivalence in the moment that is unrelated to the decision at hand. We included a similar manipulation in Study 2A, but the results did not reveal any effects on confirmation. This may be due to methodological differences and constraints in the present work. When testing for an effect of unrelated state ambivalence, we used a different ambivalence manipulation that focused on thinking about a topic one is ambivalent about and then listing the reasons why this is (van Harreveld et al., 2014) rather than using the experimental manipulation of emotional ambivalence and single-affect states as was done in past work (Rees et al., 2013). Therefore, it is possible that the manipulation we used did not work because it did not focus on affect, and affect might be a stronger cue that people also unwittingly carry over to consequent unrelated tasks (Schwarz, 2011; Schwarz & Clore, 1983).

However, we did find that greater *related* state ambivalence – ambivalence directly related to the decision – was associated with less confirmation. Earlier research indicated that related state ambivalence under some circumstances worsens bias (Sawicki et al., 2013) (Sawicki et al., 2013). However, in research by Sawicki et al. (2013), related state ambivalence was operationalized as the subjective experience of ambivalence (Priester & Petty, 1996). Subjective ambivalence was measured with items asking about the degree of mixed feelings, indecision, and conflict people felt (Sawicki et al., 2013). In our work, we only looked at the “raw” attitude people reported towards their preliminary decision and did not assess how people experienced their ambivalent or non-ambivalent attitudes. Possibly ambivalence leads to more biased information processing when the ambivalent attitude towards the issue at hand translates into the metacognitive awareness of feeling conflicted (i.e., subjective ambivalence; van Harreveld et al., 2015). When this subjective experience of the ambivalent attitude is accompanied by negative affect, people become motivated to quickly resolve their ambivalent attitude (Van Harreveld, Rutjens, et al., 2009) – likely by engaging in biased information processing (Clark et al., 2008).

### 7.1. Open questions and future work

The present work can serve as a jumping-off point for future research looking to directly explore *why* ambivalence has positive effects. As mentioned above, people with higher trait ambivalence showed both less confirmation and *more* disconfirmation (Studies 2A, 2B, and 3). Using disconfirmation entails not just focusing on the hypothesis at hand but also holding an alternative hypothesis simultaneously, which is why it may be more difficult for people to use disconfirmation (Legrenzi et al., 1993). Therefore, disconfirmation requires the capacity for cognitive and motivational complexity as well as divergent thinking (Butera et al., 2018). Possibly, highly ambivalent people have a greater capacity for divergent and de-focused thinking, allowing them to engage less in selective hypothesis testing (i.e., only focusing on the hypothesis at hand and not considering alternative ones). Therefore, a direct test of divergent thinking and selective hypothesis testing as the underlying process

of the relationship between trait ambivalence and confirmation is a fruitful avenue for future work.

Although we used samples from different populations (US, UK, and Germany), there is reason to assume that cultural differences might play a role in the relationship between trait ambivalence and confirmation. Research investigating the relationship between positive framing of contradictions and creativity found that especially people from Western cultures profited from adopting such paradoxical frames, which describes a positive framing of contradictions (Leung et al., 2018). In contrast, positive effects of paradoxical frames on creativity were not found in East Asian samples. Presumably, East Asian participants do not experience conflict when confronted with paradoxical frames. Given that paradoxical frames and ambivalence share the element of contradiction, the relationship between trait ambivalence and confirmation may be more pronounced in Western than in East Asian samples.

By consistently demonstrating that trait ambivalence is negatively connected to confirmation in decision-making, the present research helps to elucidate the relationship between personality factors and confirmation – an area where, to date, research seems to be scant (Rassin, 2008). However, there is recent work suggesting that confirmation is negatively related to the Openness domain and positively related to the Neuroticism domain of the Big Five personality traits (Melinder et al., 2020). Future research could investigate whether trait ambivalence is accordingly related to greater Openness and less Neuroticism and whether this could be an underlying mechanism of the negative relationship we found. Research examining dispositional mixed emotions found that people who often experience mixed emotions also scored higher on Openness (Barford & Smillie, 2016), suggesting that trait ambivalence, as a conceptually similar construct to dispositional mixed emotions, might also be positively related to Openness.

## 8. Conclusions

In this work, we set out to examine the relationship between trait ambivalence and confirmation – a ubiquitous form of reasoning that can have negative consequences on decision-making. In line with our hypothesis, we found that overall, higher trait ambivalence is related to less confirmation. We found this negative relationship using different paradigms and examining different aspects of confirmation. A meta-analysis over all studies further supports the robustness of our findings. Our work extends research showing that state ambivalence can have benefits for decision-making (Fong, 2006; Rees et al., 2013) by showing that trait ambivalence is related to less bias in decision-making and bolsters previous work showing that trait ambivalence is negatively related to bias in social judgment (Schneider et al., 2021). Taken together, our findings show that ambivalent people show less confirmation and instead also consider information that does not fit a currently held hypothesis. As such, this work shows that while ambivalent people might be torn, they are also balanced.

### CRedit authorship contribution statement

**Jana-Maria Hohnsbehn:** Conceptualization, Data curation, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Writing – original draft. **David F. Urschler:** Methodology, Writing – review & editing. **Iris K. Schneider:** Conceptualization, Resources, Funding acquisition, Supervision, Writing – review & editing.

### Declaration of competing interest

We have no conflict of interest to disclose. All data, analysis code, and materials can be found here: <https://osf.io/z3t65/>.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.paid.2022.111736>.

org/10.1016/j.paid.2022.111736.

## References

- Barford, K. A., & Smillie, L. D. (2016). Openness and other big five traits in relation to dispositional mixed emotions. *Personality and Individual Differences, 102*, 118–122. <https://doi.org/10.1016/j.paid.2016.07.017>.
- Basinger, S. J., & Lavine, H. (2005). Ambivalence, information, and electoral choice. *The American Political Science Review, 99*(2), 169–184. <https://doi.org/10.1017/S0003055405051580>
- Berthet, V. (2021). The measurement of individual differences in cognitive biases: A review and improvement. *Frontiers in Psychology, 12*, 419. <https://doi.org/10.3389/fpsyg.2021.630177>
- Brunswik, E. (1947). *Systematic and representative design of psychological experiments; with results in physical and social perception*.
- Brunswik, E. (1955). Representative design and probabilistic theory in a functional psychology. *Psychological Review, 62*(3), 193. <https://doi.org/10.1037/h00047470>
- Butera, F., Sommet, N., & Toma, C. (2018). Confirmation as coping with competition. *European Review of Social Psychology, 29*(1), 299–339. <https://doi.org/10.1080/10463283.2018.1539908>
- Cavazza, N., & Butera, F. (2008). Bending without breaking: Examining the role of attitudinal ambivalence in resisting persuasive communication. *European Journal of Social Psychology, 38*(1), 1–15. <https://doi.org/10.1002/ejsp.424>
- Christandl, F., Fetchenhauer, D., & Hoelzl, E. (2011). Price perception and confirmation bias in the context of a VAT increase. *Journal of Economic Psychology, 32*(1), 131–141. <https://doi.org/10.1016/j.joep.2010.09.006>
- Clark, J. K., Wegener, D. T., & Fabrigar, L. R. (2008). Attitudinal ambivalence and message-based persuasion: Motivated processing of proattitudinal information and avoidance of counterattitudinal information. *Personality & Social Psychology Bulletin, 34*(4), 565–577. <https://doi.org/10.1177/0146167207312527>
- Del Vicario, M., Bessi, A., Zollo, F., Petroni, F., Scala, A., Caldarelli, G., Stanley, H. E., & Quattrociocchi, W. (2016). The spreading of misinformation online. *Proceedings of the National Academy of Sciences of the United States of America, 113*(3), 554–559. <https://doi.org/10.1073/pnas.1517441113>
- Del Vicario, M., Quattrociocchi, W., Scala, A., & Zollo, F. (2019). Polarization and fake news. *ACM Transactions on the Web, 13*(2), 1–22. <https://doi.org/10.1145/3316809>
- DeMarree, K. G., Morrison, K. R., Wheeler, S. C., & Petty, R. E. (2011). Self-ambivalence and resistance to subtle self-change attempts. *Personality and Social Psychology Bulletin, 37*(5), 674–686. <https://doi.org/10.1177/0146167211400097>
- Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using G\* power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*(4), 1149–1160. <https://doi.org/10.3758/BRM.41.4.1149>
- Fischer, P., Fischer, J., Weisweiler, S., & Frey, D. (2010). Selective exposure to information: How different modes of decision making affect subsequent confirmatory information processing. *British Journal of Social Psychology, 49*(4), 871–881. <https://doi.org/10.1348/014466610X499668>
- Fong, C. T. (2006). The effects of emotional ambivalence on creativity. *Academy of Management Journal, 49*(5), 1016–1030. <https://doi.org/10.5465/amj.2006.22798182>
- Frey, D., & Rosch, M. (1984). Information seeking after decisions. *Personality and Social Psychology Bulletin, 10*(1), 91–98. <https://doi.org/10.1177/0146167284101010>
- Frimmer, J. A., Skitka, L. J., & Motyl, M. (2017). Liberals and conservatives are similarly motivated to avoid exposure to one another's opinions. *Journal of Experimental Social Psychology, 72*, 1–12. <https://doi.org/10.1016/j.jesp.2017.04.003>
- García-Alamino, J. M. (2020). Human biases and the SARS-CoV-2 pandemic. *Intensive & Critical Care Nursing, 58*, Article 102861. <https://doi.org/10.1016/j.iccn.2020.102861>
- Gilbert, D. T., & Malone, P. S. (1995). The correspondence bias. *Psychological Bulletin, 117*(1), 21. <https://doi.org/10.1037/0033-2909.117.1.21>
- Gillebaart, M., Schneider, I. K., & Ridder, D. T. D. (2016). Effects of trait self-control on response conflict about healthy and unhealthy food. *Journal of Personality, 84*(6), 789–798. <https://doi.org/10.1111/jopy.12219>
- Goh, J. X., Hall, J. A., & Rosenthal, R. (2016). Mini meta-analysis of your own studies: Some arguments on why and a primer on how. *Social and Personality Psychology Compass, 10*(10), 535–549. <https://doi.org/10.1111/spc3.12267>
- Griggs, R. A., & Cox, J. R. (1982). The elusive thematic-materials effect in Wason's selection task. *British Journal of Psychology, 73*(3), 407–420. <https://doi.org/10.1111/j.2044-8295.1982.tb01823.x>
- Guarana, C. L., & Hernandez, M. (2016). Identified ambivalence: When cognitive conflicts can help individuals overcome cognitive traps. *Journal of Applied Psychology, 101*(7), 1013–1018. <https://doi.org/10.1037/a004488r>
- Hänze, M. (2001). Ambivalence, conflict, and decision making: Attitudes and feelings in Germany towards NATO's military intervention in the Kosovo war. *European Journal of Social Psychology, 31*(6), 693–706. <https://doi.org/10.1002/ejsp.57>
- Hohman, Z. P., Crano, W. D., & Niedbala, E. M. (2016). Attitude ambivalence, social norms, and behavioral intentions: Developing effective antitobacco persuasive communications. *Psychology of Addictive Behaviors, 30*(2), 209–219. <https://doi.org/10.1037/adb0000126>
- Hostler, T. J., & Berrios, R. (2021). The impact of mixed emotions on judgements: A naturalistic study during the FIFA world cup. *Cognition and Emotion, 35*(2), 341–355. <https://doi.org/10.1080/02699931.2020.1840965>
- Jonas, E., Greenberg, J., & Frey, D. (2003). Connecting terror management and dissonance theory: Evidence that mortality salience increases the preference for supporting information after decisions. *Personality and Social Psychology Bulletin, 29*(9), 1181–1189. <https://doi.org/10.1177/0146167203254599>
- Kaptschuk, T. J. (2003). Effect of interpretive bias on research evidence. *BMJ (Clinical Research Edition), 326*(7404), 1453–1455. <https://doi.org/10.1136/bmj.326.7404.1453>
- Kassin, S. M., Dror, I. E., & Kukucka, J. (2013). The forensic confirmation bias: Problems, perspectives, and proposed solutions. *Journal of Applied Research in Memory and Cognition, 2*(1), 42–52. <https://doi.org/10.1016/j.jarmac.2013.01.001>
- Klayman, J. (1995). In, 32. *Varieties of confirmation bias* (pp. 385–418). Elsevier. [https://doi.org/10.1016/S0079-7421\(08\)60315-1](https://doi.org/10.1016/S0079-7421(08)60315-1)
- Klayman, J., & Ha, Y. (1987). Confirmation, disconfirmation, and information in hypothesis testing. *Psychological Review, 94*(2), 211–228. <https://doi.org/10.1037/0033-295X.94.2.211>
- Kleiman, T., & Hassin, R. R. (2013). When conflicts are good: Nonconscious goal conflicts reduce confirmatory thinking. *Journal of Personality and Social Psychology, 105*(3), 374–387. <https://doi.org/10.1037/a0033608>
- Legrenzi, P., Giretto, V., & Johnson-Laird, P. N. (1993). Focussing in reasoning and decision making. *Cognition, 49*(1–2), 37–66. [https://doi.org/10.1016/0010-0277\(93\)90035-T](https://doi.org/10.1016/0010-0277(93)90035-T)
- Leung, A. K., Liou, S., Miron-Spektor, E., Koh, B., Chan, D., Eisenberg, R., & Schneider, I. (2018). Middle ground approach to paradox: Within-and between-culture examination of the creative benefits of paradoxical frames. *Journal of Personality and Social Psychology, 114*(3), 443. <https://doi.org/10.1037/pspp0000160>
- Lilienfeld, S. O., Ammirati, R., & Landfield, K. (2009). Giving debiasing away: Can psychological research on correcting cognitive errors promote human welfare? *Perspectives on Psychological Science: A Journal of the Association for Psychological Science, 4*(4), 390–398. <https://doi.org/10.1111/j.1745-6924.2009.01144.x>
- Maio, G. R., Bell, D. W., & Esses, V. M. (1996). Ambivalence and persuasion: The processing of messages about immigrant groups. *Journal of Experimental Social Psychology, 32*(6), 513–536. <https://doi.org/10.1006/jesp.1996.0023>
- Melinder, A., Brennen, T., Husby, M. F., & Vassend, O. (2020). Personality, confirmation bias, and forensic interviewing performance. *Applied Cognitive Psychology, 34*(5), 961–971. <https://doi.org/10.1002/acp.3832>
- Nickerson, R. S. (1998). Confirmation bias: A ubiquitous phenomenon in many guises. *Review of General Psychology, 2*(2), 175–220. <https://doi.org/10.1037/1089-2680.2.2.175>
- O'Brien, B. (2009). Prime suspect: An examination of factors that aggravate and counteract confirmation bias in criminal investigations. *Psychology, Public Policy, and Law, 15*(4), 315. <https://doi.org/10.1037/a0017881>
- Olsen, R. A. (2008). *Cognitive dissonance: The problem facing behavioral finance*. <https://doi.org/10.1080/15427560801896552>
- Oswald, M. E., & Grosjean, S. (2004). *Confirmation bias. Cognitive illusions: A handbook on fallacies and biases in thinking, judgement and memory*. 79.
- Paap, K. R. (2014). The role of componential analysis, categorical hypothesising, replicability and confirmation bias in testing for bilingual advantages in executive functioning. *Journal of Cognitive Psychology, 26*(3), 242–255. <https://doi.org/10.1080/20445911.2014.891597>
- Perera, D., Chand, P., & Mala, R. (2019). Confirmation bias in accounting judgments: The case for international financial reporting standards for small and medium-sized enterprises. *Accounting & Finance, 19*(1), 1–15. <https://doi.org/10.1111/acfi.12523>
- Pillaud, V., Cavazza, N., & Butera, F. (2018). The social utility of ambivalence: Being ambivalent on controversial issues is recognized as competence. *Frontiers in Psychology, 9*, 961. <https://doi.org/10.3389/fpsyg.2018.00961>
- Pines, J. M. (2006). Profiles in patient safety: Confirmation bias in emergency medicine. *Academic Emergency Medicine: Official Journal of the Society for Academic Emergency Medicine, 13*(1), 90–94. <https://doi.org/10.1197/j.aem.2005.07.028>
- Priester, J. R., & Petty, R. E. (1996). The gradual threshold model of ambivalence: Relating the positive and negative bases of attitudes to subjective ambivalence. *Journal of Personality and Social Psychology, 71*(3), 431. <https://doi.org/10.1037/0022-3514.71.3.431>
- Rassin, E. (2008). Individual differences in the susceptibility to confirmation bias. *Netherlands Journal of Psychology, 64*(2), 87–93. <https://doi.org/10.1007/BF03076410>
- Rees, L., Rothman, N. B., Lehavy, R., & Sanchez-Burks, J. (2013). The ambivalent mind can be a wise mind: Emotional ambivalence increases judgment accuracy. *Journal of Experimental Social Psychology, 49*(3), 360–367. <https://doi.org/10.1016/j.jesp.2012.12.017>
- Rothman, N. B., Pratt, M. G., Rees, L., & Vogus, T. J. (2017). Understanding the dual nature of ambivalence: Why and when ambivalence leads to good and bad outcomes. *Academy of Management Annals, 11*(1), 33–72. <https://doi.org/10.5465/annals.2014.0066>
- RStudio Team. (2021). RStudio: Integrated Development Environment for R. RStudio, PBC. <http://www.rstudio.com/>.
- Sawicki, V., Wegener, D. T., Clark, J. K., Fabrigar, L. R., Smith, S. M., & Durso, G. R. O. (2013). Feeling conflicted and seeking information: When ambivalence enhances and diminishes selective exposure to attitude-consistent information. *Personality & Social Psychology Bulletin, 39*(6), 735–747. <https://doi.org/10.1177/0146167213481388>
- Schneider, I. K., Novin, S., & van Harreveld, F. (2022). *The ambivalent individual: Validation studies for the Trait Ambivalence Scale*. OSF Preprints. <https://doi.org/10.31219/osf.io/4cbex>.
- Schneider, I. K., Novin, S., van Harreveld, F., & Genschow, O. (2021). Benefits of being ambivalent: The relationship between trait ambivalence and attribution biases. *British Journal of Social Psychology, 60*(2), 570–586. <https://doi.org/10.1111/bjso.12417>
- Schönbrodt, F. D., & Perugini, M. (2013). At what sample size do correlations stabilize? *Journal of Research in Personality, 47*(5), 609–612. <https://doi.org/10.1016/j.jrp.2013.05.009>

- Schwarz, N. (2011). Feelings-as-information theory. In , *1. Handbook of theories of social psychology* (pp. 289–308).
- Schwarz, N., & Clore, G. L. (1983). Mood, misattribution, and judgments of well-being: Informative and directive functions of affective states. *Journal of Personality and Social Psychology*, *45*(3), 513. <https://doi.org/10.1037/0022-3514.45.3.513>
- Simons, J. J. P., Schneider, I. K., & Sanchez-Burks, J. (2018). *Ambivalence, the person and the attitude object: Individual differences in the experience of ambivalence*. PsyArXiv. <https://doi.org/10.31234/osf.io/t7tvd>
- Snyder, M., & Swann, W. B. (1978). Hypothesis-testing processes in social interaction. *Journal of Personality and Social Psychology*, *36*(11), 1202. <https://doi.org/10.1037/0022-3514.36.11.1202>
- Snyder, M., & White, P. (1981). Testing hypotheses about other people: Strategies of verification and falsification. *Personality and Social Psychology Bulletin*, *7*(1), 39–43. <https://doi.org/10.1177/014616728171007>
- Thompson, M. M., Zanna, M. P., & Griffin, D. W. (1995). Let's not be indifferent about (attitudinal) ambivalence. *Attitude Strength: Antecedents and Consequences*, *4*, 361–386.
- Urschler, D. F., Heinrich, H., Hechler, S., Fischer, P., & Kessler, T. (2019). The higher they go the harder they could fall: The impact of risk-glorifying commercials on risk behavior. *PLoS One*, *14*(12), Article e0225884. <https://doi.org/10.1371/journal.pone.0225884>
- van Harreveld, F., Nohlen, H. U., & Schneider, I. K. (2015). The ABC of ambivalence. In M. P. Zanna, & J. M. Olson (Eds.), *52. Advances in experimental social psychology* (pp. 285–324). Academic Press. <https://doi.org/10.1016/bs.aesp.2015.01.002>
- Van Harreveld, F., Rutjens, B. T., Rotteveel, M., Nordgren, L. F., & Van Der Pligt, J. (2009). Ambivalence and decisional conflict as a cause of psychological discomfort: Feeling tense before jumping off the fence. *Journal of Experimental Social Psychology*, *45*(1), 167–173. <https://doi.org/10.1016/j.jesp.2008.08.015>
- van Harreveld, F., Rutjens, B. T., Schneider, I. K., Nohlen, H. U., & Keskinis, K. (2014). In doubt and disorderly: Ambivalence promotes compensatory perceptions of order. *Journal of Experimental Psychology: General*, *143*(4), 1666. <https://doi.org/10.1037/a0036099>
- Van Harreveld, F., Van der Pligt, J., & de Liver, Y. N. (2009). The agony of ambivalence and ways to resolve it: Introducing the MAID model. *Personality and Social Psychology Review*, *13*(1), 45–61. <https://doi.org/10.1177/1088868308324518>
- Vosgerau, J., Simonsohn, U., Nelson, L. D., & Simmons, J. P. (2019). 99% impossible: A valid, or falsifiable, internal meta-analysis. *Journal of Experimental Psychology: General*, *148*(9), 1628. <https://doi.org/10.1037/xap0000187>
- Zhou, Y., & Shen, L. (2021). Confirmation bias and the persistence of misinformation on climate change. *Communication Research*. <https://doi.org/10.1177/00936502211028049>, 00936502211028049.
- Zick, A., & Preuß, M. (2016). *Einstellungen zur Integration in der Bevölkerung. Kurzbericht zum Projekt ZuGleich-Zugehörigkeit und Gleichwertigkeit. Essen: Stiftung Mercator*.