The On-going Search for Perspective-taking IRAPs: Exploring the Potential of the Natural Language IRAP

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Abstract

Under a Relational Frame Theory (RFT) framework, researchers have investigated the role of deictic relational responding (perspective-taking) in the analysis of self in relation to others, place, and time. The aim of the current research was to develop IRAPs that targeted deictic relational responding with regard to the mental states of self and others. This was pursued in a series of experiments that employed a novel version of the IRAP, known as the Natural Language-IRAP (NL-IRAP). The use of the NL-IRAP allowed for the presentation of relatively complex statements that required participants to infer the thoughts or beliefs of others on a trial-by-trial basis within the IRAP. Across a sequence of six experiments, a 'self-focused IRAP' required participants to respond to both positive and negative statements about themselves, whilst an 'other-focused IRAP' required participants to respond to similar statements about others. Experiments 1 and 2 investigated perspective-taking with regard to an *unspecified* other. Experiments 3-6 investigated perspective-taking with regard to a *specified* other, with the specified relationship between self and other manipulated across experiments. The results of Experiments 1 and 2 indicated that the other-focused IRAP produced overall bias scores that were significantly stronger than responding to the self-focused IRAP. Interestingly, non-significant differences were recorded across Experiments 3-6 when other was specified. The findings obtained across the six studies highlight potentially important limitations in the use of the NL-IRAP as a measure of perspective-taking.

Keywords: Relational Frame Theory (RFT), Natural-Language IRAP, deictic, perspective-taking

Perspective-taking appears to be a key process in the development of the self (Barnes-Holmes, Barnes-Holmes, Roche, & Smeets, 2001). As well as the mainstream approach to perspective-taking, largely represented by Theory of Mind (ToM, Sodian & Kristen, 2010), behavioral researchers working under the rubric of Relational Frame Theory (RFT) have approached perspective-taking as involving responding in accordance with three deictic relations: the *interpersonal* (I/you); the *spatial* (here/there); and the *temporal* (now/then; see Hayes, Barnes-Holmes, & Roche, 2001). The basic idea is that individuals must be able to locate themselves relationally, in space and time, relative to others, in order to learn how to take the perspective of another individual. Imagine a young child who is asked about the color of his brother's jumper and the child replies with the color of his own jumper, rather than his brother's. In this case, the child has failed to discriminate self from other, and it is thus difficult to see how this child could take the separate perspective of someone else (for a review of published RFT work on deictic relational responding, see Montoya-Rodríguez, Molina, & McHugh, 2017).

Most RFT studies on deictic relations, or perspective-taking that appears to involve these relations, have employed the Barnes-Holmes (2001) protocol, originally developed to assess and establish these relations in young children. The findings from this body of work may be summarized as follows. (1) There appear to be functional distinctions among the interpersonal, spatial, and temporal relations (e.g., Rendón, Soler, & Cortés, 2012). (2) There appear to be functional distinctions among simple deictic relations (e.g., I versus you), reversed relations (e.g., if I were you and you were me), and double reversed relations (e.g., if I were you and you were me, and if here were there and there were here, see McHugh, Barnes-Holmes, & Barnes-Holmes, 2004). (3) Deictic relational responding can be established through training and appears to generalize to other examples of natural language (e.g., Heagle & Rehfeldt, 2006; Weil, Hayes, & Capurro, 2011). (4) Interpersonal and simple

relations appear to emerge first (e.g., McHugh et al.). (5) Competence in deictic relational responding correlates with cognitive abilities, IQ (Gore, Barnes-Holmes, & Murphy, 2010), and ToM tests (Weil et al.).

Several later studies employed the Barnes-Holmes (2001) protocol for more clinical rather than developmental purposes. For example, Villatte, Monestés, McHugh, Baque, and Loas (2008) reported somewhat greater competence on the protocol for individuals with high versus low social anhedonia. Similarly, Villatte, Monestés, McHugh, Freixa i Baqué, and Loas (2010) reported some superiority for a control group versus individuals with a diagnosis of schizophrenia. However, some researchers have raised concerns about using the original protocol to draw conclusions about clinical phenomena (Hussey et al., 2014), which include: the protocol's developmental focus; the fact that even typically-developing adults show deficits on specific deictic relations (Vitale, Barnes-Holmes, Barnes-Holmes, & Campbell, 2008); and the fact that RFT does not necessarily predict that psychological suffering involves deficits in deictic relational responding.

Researchers have therefore begun to explore other methodologies, such as the Implicit Relational Assessment Procedure (IRAP), to study deictic relational responding (see Golijani-Moghaddam, Hart, & Dawson, 2013; Vahey, Nicholson, & Barnes-Holmes, 2015, for recent reviews of the reliability and validity of the IRAP). Two published studies have thus far used the IRAP to investigate deictic relations, particularly in terms of comparing responding to self versus responding to others. Barbero-Rubio, López- López, Luciano, and Eisenbeck (2016) presented participants with what they referred to as a *perspective-taking IRAP* that contained each participant's own name (self) versus the name of the researcher (other) as label stimuli, and statements describing specific characteristics of the self (e.g., "is in front of the laptop") versus other (e.g., "is standing up") as targets, along with "Yes" and "No" as response options. In order to manipulate perspective-taking, explicit rules were provided prior to each

block of trials. Specifically, in order to encourage responding from one's own perspective, participants in some blocks were instructed: "For the next block of trials, you have to respond as if you were you and Adrian [researcher] were Adrian." In contrast, in order to encourage responding from the perspective of another, participants in other blocks were instructed: "For the next block of trials, you have to respond as if you were Adrian and Adrian were you." The four trial types were referred to as: *I-I* (participant name-participant characteristics); *Other-Other* (researcher name-researcher characteristics); *I-Other* (participant name-researcher characteristics); and *Other-I* (researcher name-participant characteristics). In general, the latency data reported by Barbero-Rubio et al. showed significantly more rapid responding on the *I-I* trial type, relative to the other three trial-types during self-perspective blocks. The differences between self- and other-perspective blocks for each trial type were also in the predicted direction (i.e., shorter on self-perspective), and these differences were significant in terms of the normalized D_{IRAP}-scores. Overall, the researchers concluded that these significant D_{IRAP}-scores indicated that the participants had little flexibility in changing from their own perspective to another perspective.

In a systematic replication of the Barbero-Rubio et al. (2016) study, Kavanagh, Barnes-Holmes, Barnes-Holmes, McEnteggart, and Finn (2018) used a similar IRAP, but the study also included a control IRAP that did *not* require responding to self versus other. That is, instead of comparing self with other, the control IRAP compared responding between two separate others (i.e., the researcher and a picture of another unknown participant). In Experiment 1, the data from the IRAP showed significantly stronger responding on the *I-I* trial type versus *Other-Other*, but there was no difference in the control IRAP between *Researcher-Researcher* and *Other-Other*. Whilst a range of methodological differences between the two studies preclude systematic comparisons, both studies did show evidence of

differences in responding to self versus other, but no difference in responding to two others in the context of the control IRAP.

One possible concern that could be raised regarding the two studies involving the self-versus other-IRAPs described above is that differences that emerged between responding to self and other within the IRAP could be attributed to factors other than perspective-taking per se. For example, in the study by Kavanagh et al. (2018) a pattern known as the single trial type dominance effect (STTDE) emerged in Experiment 1. That is, the size of the D_{IRAP}-score for the *I-I* trial type was significantly larger than for the *Other-Other* trial type. Although this dominance effect could indicate a history of responding from one's own perspective more frequently than from another perspective, it does not necessarily indicate differences in the relative ability to take the perspective of self versus another (see Kavanagh et al. for a detailed discussion). To appreciate the argument we are making, other recent research has also reported a STTDE when shapes and colors were presented as categories within the IRAP (Finn, Barnes-Holmes, & McEnteggart, 2018). Specifically, larger D_{IRAP}-scores were shown on color-color than on shape-shape trial types and this effect appeared to be driven by a higher frequency of the use of color-related words in natural language over the use of shape-related words. Obviously, no perspective-taking was required when participants were simply asked to categorize colors as colors and shapes as shapes, and thus the same logic could be applied to a single IRAP that requires responding to self versus other (i.e., the effect could be the result of responding to self more frequently than to other in natural language, rather than an ability to perspective-take).

A second potential concern that could be raised regarding the two studies involving the self- versus other-IRAP pertains to the simple target phrases that specified characteristics of self and other (e.g., "is sitting down", "is the participant", "is in front of the computer"). As such, it could be argued that responding on the IRAP simply required deictic relational

responding but not perspective-taking. Indeed, perspective-taking would appear to require more complex target statements or relational networks that involve taking the perspective of self versus other. For example, such statements could take the form of "When event X happens, self or other thinks or feels Y." In principle, this sort of complex relational network requires that the participant responds to statements that coordinate with how the self responds to particular events, versus how they perceive others will respond to the same events. Such an IRAP, at least in terms of face validity, appears to target perspective-taking, as we generally understand it. Developing such an IRAP would necessarily involve inserting relatively complex statements or networks into the procedure. In doing so, the separation of the stimuli within an IRAP into labels and targets may be problematic because participants may simplify the task by responding to single words or subclauses within the labels and targets in such a way that fails to capture perspective-taking. One way of potentially avoiding this problem would be to employ a natural language format previously reported by Kavanagh, Hussey, McEnteggart, Barnes-Holmes, and Barnes-Holmes (2016). In that study, the IRAP combined the label and target stimuli to form statements that are more similar to natural language.

Based on this reasoning, the current series of experiments employed two IRAPs to study deictic relations, but using a natural language format, with one IRAP targeting self-perspective and the other targeting other-perspective. The general strategy pursued here was to determine the extent to which the two Natural Language-IRAPs (NL-IRAPs) in each experiment would yield any differences in the direction and/or strength of the individual trial type effects. In addition, correlational analyses were conducted to determine the extent to which the two NL-IRAPs correlated, or failed to correlate, with each other and with a range of self-report measures that were deemed to be relevant to perspective-taking.

Given the exploratory nature of the research, the self-report measures we selected from experiment to experiment were not based on a well-established theoretical rationale.

Rather, we simply used measures that had frequently been used in previous studies of perspective-taking within the field of contextual behavioral science. In the later experiments, measures of attachment were included based on comments provided by the first author's Doctoral Advisory Committee, who advised that these measures could be relevant when attempting to analyze perspective-taking with regard to others with whom a participant might have a significant relationship.

Experiments 1 and 2 focused on self versus other when the other was unspecified, whereas Experiments 3-6 focused on self versus other across differences in potentially key aspects of the other, such as similarity with, and difference from, self. In developing the two IRAPs employed in each experiment (i.e., self- versus other-focused), we sought to manipulate only the 'self versus other' variable. Thus, any difference that emerged between the two IRAPs could be readily interpreted as based on the self versus other foci. Because Experiment 1 was exploratory, we did not make any formal predictions.

<div align="center">

Experiment 1

</div>

Method

Participants. Fifty-four participants were recruited for Experiment 1, 44 females and 11 males. Participants ranged from 17-38 years old ($M = 20.89$) and were recruited through random convenience sampling from the Department of Experimental, Clinical and Health Psychology, Ghent University participant pool. Each participant was paid an hourly rate of 10 euro. The general strategy for recruiting numbers of participants was guided by the results of a recent meta-analysis of IRAP effects in the clinical domain, indicating that a minimum of 29 is required to achieve a power of 0.8 for first-order correlations (Vahey, Nicholson, & Barnes-Holmes, 2015). Because participants sometimes failed to reach various performance criteria for the IRAP (details provided subsequently), it was necessary to recruit more than 29 participants in each experiment to yield an adequate dataset for analyses.

Materials and apparatus. Experiment 1 comprised two computer-based tasks: an other-focused IRAP and a self-focused IRAP. The experiment also included the Community Assessment of Psychic Experiences (CAPE) and the Acceptance and Action Questionnaire-II (AAQ-II). All materials were presented in Dutch, but are presented in English in the current article. The CAPE was employed because perspective-taking has been implicated in psychotic-like experiences (e.g., Savla, Vella, Armstrong, Penn, & Twamley, 2013). The use of the AAQ-II was more exploratory in that we aimed simply to determine if perspective-taking measured with self and other IRAPs correlated with psychological flexibility.

Other-focused IRAP. The other-focused IRAP required participants to respond to various statements about other people. These statements were presented in a natural language format, rather than as label and target stimuli, to form a regular sentence or statement. The IRAP presented 16 statements, each of which comprised two parts. The statement referred to an event (deemed positive or negative) and a positive or negative reaction to that event. The sequence in which the event and reaction were presented in each statement could vary, in that the event could be presented before the reaction, or the reaction could be presented before the event. Nevertheless, the 16 statements were divided into four trial types (see Figure 1), based on whether the event and the reaction were both positive, both negative, or a combination of positive and negative (see Table 1). For illustrative purposes, consider the four following statements "People will be proud if they succeed in their exams" (*Positive Event-Positive Reaction*); "Others are frustrated when they pass an exam" (*Positive Event-Negative Reaction*); "Others feel lucky if they fail an exam" (*Negative Event-Positive Reaction*); and "If others fail an exam, then they are disappointed" (*Negative Event-Negative Reaction*). The response options "Yes" and "No" were presented at the bottom left- and right-hand corners on each trial. The reader should note that the NL-IRAP presented some statements that could be seen as potentially confusing, in terms of how participants should respond, particularly the

Positive-Negative and *Negative-Positive* statements. However, the general structure of the

NL-IRAP remained the same as the standard IRAP in that two of the four trial types could be
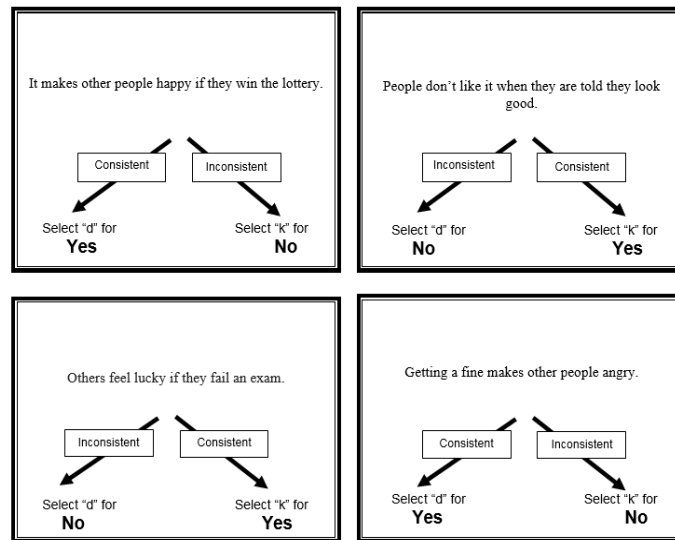
seen as less coherent than the other two.

Fig. 1 Examples of the four trial types in the other-focused IRAP: *Positive Event-Positive Reaction*, *Positive Event-Negative Reaction, Negative Event-Positive Reaction, Negative Event-Negative Reaction*. The arrows and words *Consistent* and *Inconsistent* were not shown on-screen. Trial type labels denote each of the two parts of the statement, but not necessarily the sequence in which they appeared in the statement

Table 1
Natural language statements from the other-focused IRAP

Trial types	Stimuli
Positive Event - Positive Reaction	If others hear that they look good, their self-esteem enhances. If the enemy of other people dies, they feel liberated. It makes other people happy if they win the lottery. People will be proud if they succeed in their exams.
Positive Event - Negative Reaction	People don't like it when they are told they look good. If other people's enemy dies they become angry. Other people are disappointed when they win the lottery Others are frustrated when they pass an exam.
Negative Event - Positive Reaction	Other people are happy when a loved one dies. Getting fines makes other people happy. Others feel lucky if they fail an exam. If another person's enemy wins the lottery, they will be happy.
Negative Event - Negative Reaction	Other people feel despair when a loved dies. Getting a fine makes other people angry. If others fail an exam then they are disappointed. Other people become bitter if their enemy wins the lottery.

Note: Statements were presented to participants in Dutch. Trial type labels denote each of the two parts of the statement, but not necessarily the sequence in which they appeared in the statement

Self-focused IRAP. The self-focused IRAP was similar to the other-focused IRAP, but required participants to respond to various statements about themselves, rather than about others (e.g., "I'm proud when I succeed in my exams"). These 16 statements were also presented in a natural language format and comprised two parts, an event and a reaction (see Table 2). Again, "Yes" and "No" were the response options. The self-focused IRAP comprised the same four trial types as above (see Figure 2).

Table 2

Natural language statements from the self-focused IRAP

Trial-types	Stimuli
Positive Event - Positive Reaction	My self-esteem increases if someone says I look good.
	I feel liberated if my enemy dies.
	Winning the lottery makes me happy.
	I'm proud when I success in my exams.
Positive Event - Negative Reaction	I feel ugly if someone says I look good.
	I'm angry if my enemy dies.
	Winning the lottery disappoints me.
	It frustrates me if I succeed in my exams.
Negative Event - Positive Reaction	I'm happy if a loved one dies.
	Getting fines make me happy.
	Failing an exam is fantastic.
	I rejoice if someone I hate wins the lottery.
Negative Event - Negative Reaction	If a loved one dies, I'm miserable.
	Getting a fine makes me angry.
	Failing an exam is disappointing.
	It irritates me if someone I hate wins the lottery.

Note: Statements were presented to participants in Dutch. Trial type labels denote each of the two parts of the statement, but not necessarily the sequence in which they appeared in the statement
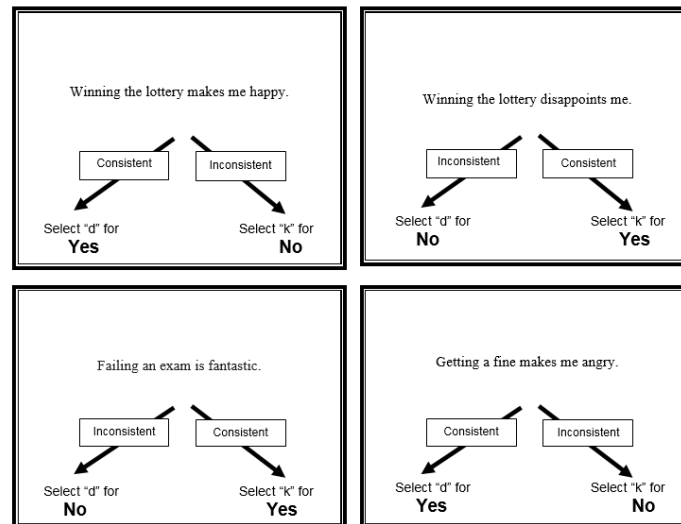
Fig. 2 Examples of the four trial types in the self-focused IRAP: *Positive Event-Positive Reaction, Positive Event-Negative Reaction, Negative Event-Positive Reaction, Negative Event-Negative Reaction*. The arrows and words *Consistent* and *Inconsistent* were not shown on-screen. Trial type labels denote each of the two parts of the statement, but not necessarily the sequence in which they appeared in the statement

The Community Assessment of Psychic Experiences (CAPE; Stefanis et al., 2002).

The CAPE measures psychotic-like experiences in the general population. The scale consists

of 42 symptom items rated along three subscales: positive symptoms (20 items, e.g., "Do you

ever feel as if there is a conspiracy against you?"), negative symptoms (14 items, "Do you

ever feel that you experience few or no emotions at important events?") or depressive

symptoms (eight items, "Do you ever feel sad?"). Each item is rated on two 4-point Likert

scales from 0 (*never*) to 3 (*nearly always*) to indicate (1) the frequency of symptoms and (2)

the level of distress associated with each symptom. The CAPE provides overall frequency and

distress scores of psychic experiences, and total frequency and distress scores for each of the

three subscales. In order to account for partial non-responses, all scores are weighted for the

number of valid answers per subscale (i.e., sum score divided by number of items completed).

Overall frequency and distress scores are also weighted. In all cases, higher scores indicate

greater frequency or distress regarding symptoms, although there are no clinical cut-offs for

this measure. The Dutch version was completed by participants. The scale has demonstrated

adequate reliability: positive dimension alpha = 0.63, negative dimension alpha = 0.64, and depressive dimension alpha = 0.62 (Konings, Hanssen, Van Os, & Krabbendam, 2006).

Acceptance and Action Questionnaire-II (AAQ-II 7-item version; Bernaerts, De Groot, & Kleen, 2012). The AAQ-II measures acceptance, experiential avoidance, and psychological inflexibility. The scale consists of seven items rated on a 7-point Likert scale from 0 (*never true*) to 7 (*always true*). The AAQ-II yields an overall score with a maximum of 49 indicating *low psychological flexibility* and a minimum of 7 indicating *high psychological flexibility.* While the measure was not designed as a diagnostic tool, Bond et al. (2011) reported that scores ≥24 correlate with psychological distress. The English version of this scale has been shown to have good internal consistency (*alpha* = .84, Bond et al.). The Dutch translation, used here, has yielded similar reliability values (*alpha* = .85, Bernaerts et al.).

Procedure. Experiment 1 took place on an individual basis in sound-proof cubicles at the Department of Experimental,s Clinical and Health Psychology, Ghent University. Informed consent was obtained from all participants. Each participant was exposed to the other-focused and self-focused IRAPs, with the order of each counterbalanced across participants. Participants thereafter completed the CAPE, followed by the AAQ-II, always presented in this order.

Other-focused IRAP. The other-focused IRAP comprised a maximum of eight pairs of practice blocks, followed by three pairs of test blocks. On each trial, an other-related statement was presented in the middle of the screen (e.g., "People will be proud if they succeed in their exams"), with two response options ("Yes" and "No") at the bottom left and right of the screen. Participants were simply instructed to figure out, based on individual trial feedback, what the task involved. Participants responded on each trial using either the "d" key for the response option on the left or the "k" key for the response option on the right. The

locations of the response options "Yes" and "No" alternated from trial to trial in a quasi-random order, such that they did not remain in the same left-right locations for more than three successive trials. The instruction "The previously correct and incorrect answers have been reversed" was presented between blocks of trials.

When participants selected the response option that was deemed correct within that block, an inter-trial interval of 400 ms was presented, after which the next trial occurred. When participants selected the response option that was deemed incorrect for that block, the stimuli remained on the screen and a red "X" appeared beneath the statement. Only when the correct response option was selected did the program proceed to the 400 ms inter-trial interval (followed by the next trial). This pattern of trial presentations, with corrective feedback, continued until the entire block of 32 trials was presented. Trials were presented in a quasi-random order within each block, with the constraint that each statement was presented twice across the 32 trials. *Consistent* trial blocks required responding that was deemed to be in accordance with positive events producing positive reactions and negative events producing negative reactions (i.e., *Positive Event-Positive Reaction/Yes, Positive Event-Negative Reaction/No, Negative Event-Positive Reaction/No,* and *Negative Event-Negative Event/Yes)*. *Inconsistent* trial blocks required responding that was in accordance with positive events producing negative reactions and negative events producing positive reactions (i.e., *Positive Event-Positive Reaction/No, Positive Event-Negative Reaction/Yes, Negative Event-Positive Reaction/Yes,* and *Negative Event-Negative Reaction/No)*. The other-focused IRAP always commenced with a consistent block of trials.

When participants completed each block of trials, the IRAP program provided them with feedback on their performance during that block. The feedback consisted of a message informing them how accurately and how quickly they had responded overall during that block. The average speed of responding was calculated from stimulus onset to the first correct

response across all 32 trials within the block. Participants were required to achieve a maximum median latency of no more than 5000 ms *on each trial type*. While we recognize that 5000 ms is unusually long for the latency criterion in an IRAP (most range between 2000 ms and 3000 ms), our initial pilot work indicated that most participants failed to reach the latency criterion when set at <5000 ms., especially when the criterion was set at the trial type level (the IRAP latency criterion is typically set at the block level). It is also important to remember that the IRAP effect is calculated from the difference in mean latencies between blocks of trials, rather than from the absolute length of the latencies. As such, the IRAP effect, even when the latency criterion is set relatively high at 5000ms., consists of the difference in average latencies between the blocks, which remains relatively short (i.e., no more than a few hundred milliseconds).

Participants were also required to achieve a minimum accuracy of no less than 75%, also set at the trial type level (i.e., no more than 2 errors were permitted per trial type). If participants achieved both accuracy and latency criteria on any pair of practice blocks, they proceeded to the first pair of test blocks; if they failed on the eighth pair of practice blocks, participation in the experiment was terminated. Although setting the accuracy criterion at 75% is lower than many other studies that have used 80% or more, it is important to note that the accuracy criterion was set at the trial type, rather than the block, level. Setting the accuracy criterion at the trial type level requires a high level of accuracy across all trial types and thus, in a sense, is more stringent than 80% at the block level.

A fixed set of six test blocks was presented with no accuracy or latency criteria required for participants to progress from one block to the next. However, percentage correct and median latency were again presented at the end of each block to encourage participants to maintain criterion-level responding from the practice blocks.

Self-focused IRAP. The format of the self-focused IRAP was identical to the other-focused IRAP, but with statements regarding the self, rather than statements regarding others (e.g., "It irritates me if someone I hate wins the lottery"). It was particularly important in this IRAP to ensure that participants were responding to each of the statements *from their own perspective.* Hence, participants were instructed at the beginning of the IRAP, as follows: "The program will present statements on the screen which refer to you. Please remember that when you see "I" or "me" on-screen, this refers to you (the participant)". The designation of consistent and inconsistent blocks was identical to the previous IRAP. Again, all participants were first presented with a *consistent* block of trials.

Questionnaires. Participants completed the two questionnaires in the following sequence: the CAPE followed by the AAQ-II.

Results and Discussion

Questionnaire data. A summary of the means and standard deviations for the AAQ-II and the CAPE weighted overall and with subscale scores is provided in Appendix A. The mean AAQ-II score fell below 24, indicating little or no psychological distress. All weighted overall and subscale scores of the CAPE were relatively low.

IRAP data. Consistent with standard IRAP practice, mean response latencies for consistent and inconsistent blocks were initially divided according to trial type and calculated for each participant (see Barnes-Holmes, Barnes-Holmes, Stewart, & Boles, 2010). Based on the latency and accuracy criteria, three participants failed to complete the practice blocks (and did not proceed to the test blocks) on the self-focused IRAP, and four failed to complete the practice blocks on the other-focused IRAP. Hence, all seven datasets were excluded from further analyses. For the remaining participants, the same accuracy and latency criteria were applied in the test blocks, except that the criteria now applied across *all six* test blocks. This meant that no more than eight errors were permitted per trial type across the six test blocks.

Using these criteria, five participants failed to complete the self-focused IRAP and five failed the other-focused IRAP. All 10 datasets were excluded from further analyses, leaving the final number of datasets in the analyses at $N = 37$.

D_{IRAP}-scores. Consistent with the majority of published IRAP studies, D_{IRAP}-scores for both IRAPs were calculated for each of the four trial types (see Barnes-Holmes et al., 2010), such that positive D_{IRAP}-scores during consistent blocks indicated responding "Yes" more quickly than "No" on *Positive Event-Positive Reaction* and *Negative Event-Negative Reaction* trial types, and responding "No" more quickly than "Yes" on *Positive Event-Negative Reaction* and *Negative Event-Positive Reaction* trial types. Negative D_{IRAP}-scores indicated the opposite pattern: "No" more quickly than "Yes" on *Positive Event-Positive Reaction* and *Negative Event-Negative Reaction* trial types, and responding "Yes" more quickly than "No" on *Positive Event-Negative Reaction* and *Negative Event-Positive Reaction* trial types.

The mean D_{IRAP}-scores and standard errors for each trial type for both IRAPs are presented in Figure 3. Positive scores were recorded for all four trial types, with the weakest observed for *Negative Event-Positive Reaction*. For each of the trial types, the mean D_{IRAP}-scores were greater for the other-focused IRAP, with the largest difference for the *Negative Event-Negative Reaction* trial type. A 2x4 repeated measures Analysis of Variance (ANOVA) yielded a significant main effect for IRAP type [$F(1, 36) = 4.12$, $p < .05$, $\eta_\rho^2 = .1$] and for trial type [$F(1, 36) = 10.14$, $p < .01$, $\eta_\rho^2 = .22$] but no significant interaction ($p > .3$). Post-hoc (Fisher's PLSD) comparisons among the four trial types, see Table 3, indicated that *Negative Event-Positive Reaction* differed significantly from the other three trial types and *Positive Event-Positive Reaction* differed from *Negative Event-Negative Reaction*. In examining Figure 3, it appears that the significant difference between the *Positive Event-Positive Reaction* and *Negative Event-Negative Reaction* trial types was driven largely by the other-focused IRAP. On balance, the interaction between IRAP type and trial type was non-

significant, and thus it would be unwise to draw any strong conclusions at this point. Indeed,

the next study was a direct replication conducted primarily to determine if the difference

between the IRAPs was robust and if the relatively strong D_{IRAP} effect for the *Negative Event-*

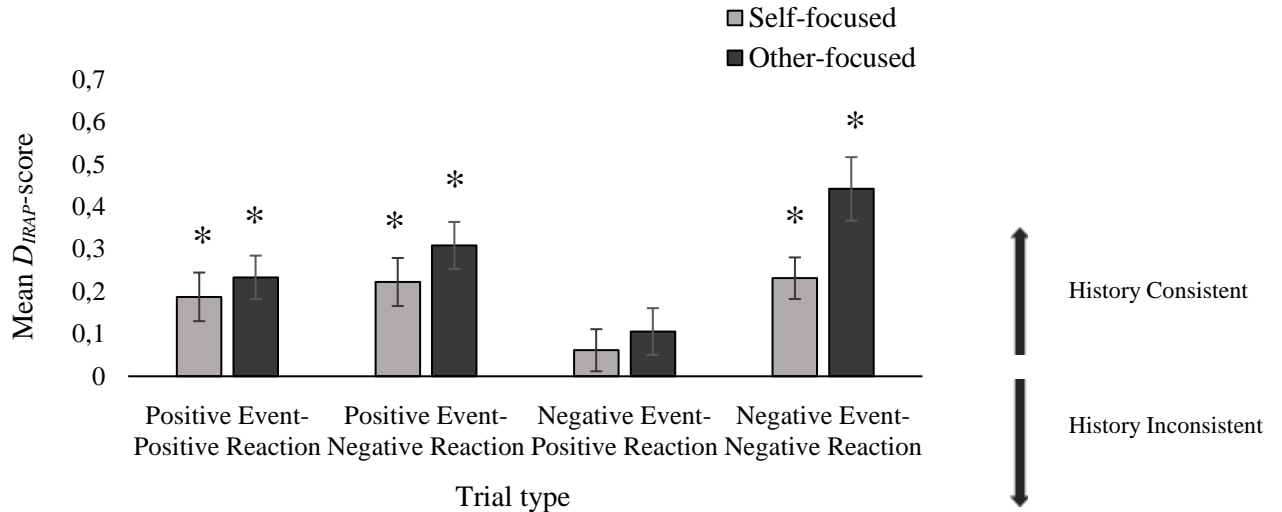*Negative Reaction* trial type in the other-focused IRAP would be observed again.

Fig. 3 Mean D_{IRAP}-scores on the self-focused IRAP trial types and other-focused trial types in Experiment 1. **Positive D_{IRAP}-scores indicate history-consistent responding and negative D_{IRAP}-scores indicate history-inconsistent responding.** *Indicates D_{IRAP}-scores that are significantly different from zero

Table 3
Experiment 1 Fisher's PLSD Comparisons

Trial type	Mean Difference	p
Positive Event-Positive Reaction/ Positive Event–Negative Reaction	-0.06	.25
Positive Event- Positive Reaction/ Negative Event-Positive Reaction	0.13	<.01*
Positive Event- Positive Reaction/ Negative Event-Negative Reaction	-0.13	<.01*
Positive Event-Negative Reaction/ Negative Event- Positive Reaction	0.18	<.001*
Positive Event-Negative Reaction/ Negative Event- Negative Reaction	-0.07	.14
Negative Event-Positive Reaction/ Negative Event-Negative Reaction	-0.25	<.001*

* Indicates significant *p* values.

Correlations. Given that there was a significant main effect for IRAP type, but no interaction with trial type, a single overall D-score (the mean of the four trial types) was calculated for each IRAP, and then subjected to correlational analyses with the questionnaires (a total of nine correlations for each IRAP). Neither set of correlations proved to be significant (all rs < .32 and all ps > .05). In order to determine if *differences in responding to self and others* across the two IRAPs correlated with psychological symptoms, we calculated an IRAP difference score by subtracting the other-focused overall D-score from the self-focused overall D-score for each participant, and then subjected this to correlational analyses with the questionnaires (a total of nine correlations, not shown). The frequency of positive psychotic-like symptoms was the only significant correlation [$r(37) = 0.34$, $p = 0.039$], but did not remain so after a Bonferroni correction.[1] Finally, the overall D-scores from the two IRAPs were correlated and this single correlation proved to be non-significant ($r = 0.208$ and $p = 0.219$).

Summary. The results from Experiment 1 indicated that the other-focused IRAP produced bias scores that were significantly stronger than the self-focused IRAP. There was no significant interaction between IRAP type and trial type, although visual inspection of Figure 3 indicated a large difference between IRAPs for the *Negative Event-Negative Reaction* trial type. Only one of the 27 correlations proved to be significant, but did not remain so after a Bonferroni correction. Overall therefore, the data indicated that there was a significant difference between the self- and other-focused IRAPs, that the IRAP difference score correlated with psychotic-like symptoms, and that the two IRAPs failed to correlate with each other. This pattern of results suggests that the self- and other-focused IRAPs were tapping into different behavioral repertoires, and in this sense this first experiment could be

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[1] Throughout the current manuscript, we have adopted the strategy of *not* correcting for multiple tests of statistical significance, but instead we report actual p values. However, we also report if the values remain significant following correction for multiple tests.

seen as a success. On balance, given the novelty of the procedure employed in Experiment 1 (i.e., the NL-IRAP), it was deemed important to conduct a direct replication of the study, with additional questionnaires. Because Experiment 2 remained exploratory, we did not make any formal predictions.

Experiment 2

Experiment 2 was a direct replication of Experiment 1, except that the AAQ-II was omitted and replaced with several measures of emotional attachment, relationships, and self-warmth. A measure that was in development at that time, the Psychological Flexibility Index (PFI), was also included in the battery of tests. All questionnaires were completed after the participants had finished the IRAPs.

Method

Participants. Fifty-one individuals were recruited for Experiment 2, 37 females, 14 males. Ages ranged from 18-49 years ($M = 24.5$). All participants were recruited through random convenience sampling from the Department of Experimental, Clinical and Health Psychology, Ghent University participant pool and were paid an hourly rate of 10 euro.

Materials and apparatus. Both IRAPs were identical to Experiment 1. The CAPE was included again. Five additional questionnaires assessed: psychological flexibility (using the Psychological Flexibility Index, PFI); self-warmth (using a Self-warmth Thermometer); emotional attachments (using the Experiences in Close Relationships-Relationship Structures questionnaire, ECR-RS); and relationships with others (The Inclusion of Other in the Self, IOS; and the Experiencing of Self Questionnaire, ESQ). The PFI replaced the AAQ-II as a measure of psychological flexibility because it was being developed by Bond and colleagues as an alternative to the AAQ. The Self-warmth Thermometer was included to determine whether performance in the self-IRAP correlated with self-warmth (Vahey, Barnes-Holmes, Barnes-Holmes, & Stewart, 2009). The various attachment questionnaires were included

because pre-existing difficulties in attachment relationships may manifest in difficulties in

perspective-taking with regard to others (Bernstein, Laurent, Nelson, & Laurent, 2015). All

materials were presented in Dutch (translated into English when referred to in the text). The

CAPE was the only questionnaire with a validated Dutch version. The instructions and items

of the remaining measures were created using a backward forward translation procedure

(World Health Organization, WHO, 2017). There are no clinical cut-offs for any of the

measures.

Psychological Flexibility Index (PFI). The PFI is a measure of psychological

flexibility currently being developed by Bond and colleagues. In its current format, the

measure includes 82 items. Each item is rated on a 6-point Likert scale from 1 (*disagree*

strongly) to 6 (*agree strongly*), with a minimum of 82 and a maximum of 492, generated by

reversing relevant items and then summing the scores. Higher scores indicate higher levels of

psychological flexibility, with lower scores indicating lower flexibility. At present, there are

no reliability data on this measure.

Experiences in Close Relationships-Relationship Structures questionnaire (ECR-

RS; Fraley, Heffernan, Vicary, & Brumbaugh, 2011). The ECR-RS assesses attachment

patterns in four close relationships (mother, father, romantic partner, and best friend). Each of

the four relationships is rated as a separate domain along two subscales: a) anxious attachment

and b) avoidant attachment. The *anxious attachment* subscale comprises 3 items (e.g., "I'm

afraid that this person may abandon me") with a maximum possible score of 21 and a

minimum of 3. The *avoidant attachment* subscale comprises 6 items (e.g., "I don't feel

comfortable opening up to this person"), with a maximum possible score of 42 and a

minimum of 6. Each item is rated on a 7-point Likert scale from 1 (*strongly disagree*) to 7

(*strongly agree*). Higher scores indicate higher levels of avoidant attachment and anxious

attachment. According to Fraley et al., the *alpha* reliabilities for the four relationship domains

in the avoidant subscale are between .81 and .92, with the anxiety subscale between .83 and .87. Test-retest reliability is available for only two domains on each subscale, but is adequate (*alpha* =.65 for romantic relationships and .80 for parental relationships).

    Inclusion of Other in the Self (IOS; Aron, Aron, & Smollan, 1992). The IOS is a measure of closeness in relationships, comprising two sets of seven Venn diagrams. All Venn diagrams contain one circle that represents the self, while the other circle represents a "best friend" or "other people generally". As such, each set of Venn diagrams represents the relationship between self and a significant other (best friend) or between self and a non-significant other (other people generally). Seven Venn diagrams were presented in each set, with each Venn diagram differing systematically in terms of the extent of the overlap between the two circles. Specifically, in the first Venn diagram, the two circles are completely separate, whereas in the seventh Venn diagram, the two circles are almost fully overlapping, with each Venn diagram in-between showing some variation from one extreme to the other. In order to yield one overall score for the relationship between self and best friend, and one overall score for the relationship between self and other people generally, each Venn diagram is allocated a number between 1 and 7, where 1 represented the least overlap, and 7 represented the most. Hence, the maximum score for best friend/other people generally was 7, with the minimum score 1. The IOS has demonstrated adequate reliability (*alpha* = .93, see Aron et al.).

    Experiencing of Self Scale (EOSS; Kanter, Parker, & Kohlenberg, 2001). The EOSS measures the control of others over the experience of the self. It consists of 20 items rated along four subscales (each with 5 items): casual acquaintances-absent (e.g., "My feelings are influenced by casual acquaintances when I am alone"); casual acquaintances-present (e.g., "My wants are influenced by casual acquaintances when I am with them"); close relationships-absent (e.g., "My attitudes are influenced by close relationships when I am

alone"); and close relationships-present (e.g., "My actions are influenced by close

relationships when I am with them"). Each item is rated on a 7-point Likert scale from 1

(*never true*) to 7 (*always true*). The maximum overall score is 140 and the minimum is 20,

with high scores indicating greater control of others over the experience of self. According to

Kanter et al., the scale overall has high internal consistency (*alpha* = 0.91), with internal

consistency in the subscales ranging from *alpha* .83-.93.

  Self-warmth Thermometer. A feeling-thermometer adapted from Vahey et al. (2009)

was used as a measure of subjective self-warmth. The current measure composed an

illustrated thermometer with a continuous horizontal scale from 0 (*cold*), rising in intervals of

10, to 100 (*warm*). Participants were required to indicate their self-warmth from 0-100. Given

that this is not a standardized measure, there are no reliability data.

  Procedure. The two IRAPs were identical to Experiment 1. Participants thereafter

completed the CAPE, PFI, IOS, ECR-RS, EOSS, and the Self-warmth Thermometer, always

presented in this order. All questionnaires were presented to participants via computer using

the program Psychopy (Pierce, 2007).

Results and Discussion

  Questionnaire data. A summary of the means and standard deviations of each

questionnaire and relevant subscales is provided in Appendix B. The mean score on the Self-

warmth Thermometer was around the mid-way point at 56.65 (/100) and as such was

consistent with previous samples (see Vahey et al., 2009). The overall PFI scores were

relatively high, indicating high psychological flexibility. The overall CAPE and subscale

scores were relatively low, indicating low psychotic-like symptoms. The ECR-RS scores were

also relatively low in terms of both attachment-anxiety and attachment-avoidance. The overall

EOSS and subscale scores were low, indicating low control by others over the experience of

self. The IOS scores for best friend were higher than for other people, suggesting a closer

relationship in this regard. Nothing unusual or unexpected, therefore, emerged from the questionnaires, given the use of a non-clinical sample.

IRAP data. One participant failed the practice blocks on the self-focused IRAP and another participant failed to complete self-reports, and thus their IRAP data was excluded from further analysis. The final number of participants included in the analyses was $N = 49$.

D_{IRAP}-scores. The mean D_{IRAP}-scores and standard errors for each trial type for both IRAPs are presented in Figure 4. Positive scores were recorded for all four trial types, with the weakest observed for *Negative Event-Positive Reaction*. For three of the four trial types, the mean D_{IRAP}-scores were greater on the other-focused IRAP, with the largest difference between IRAPs for *Positive Event-Negative Reaction*. A 2x4 mixed repeated measures ANOVA produced a main effect for IRAP type [$F(1, 48) = 4.61$, $p = .04$, $\eta_\rho^2 = .09$], and for trial type [$F(1, 48) = 4.42$, $p < .01$, $\eta_\rho^2 = .09$] but no significant interaction ($p > .1$). Post-hoc (Fisher's PLSD) comparisons among the four trial types, see Table 4, indicated that *Negative Event-Positive Reaction* differed significantly, or marginally so, from the other three trial types.
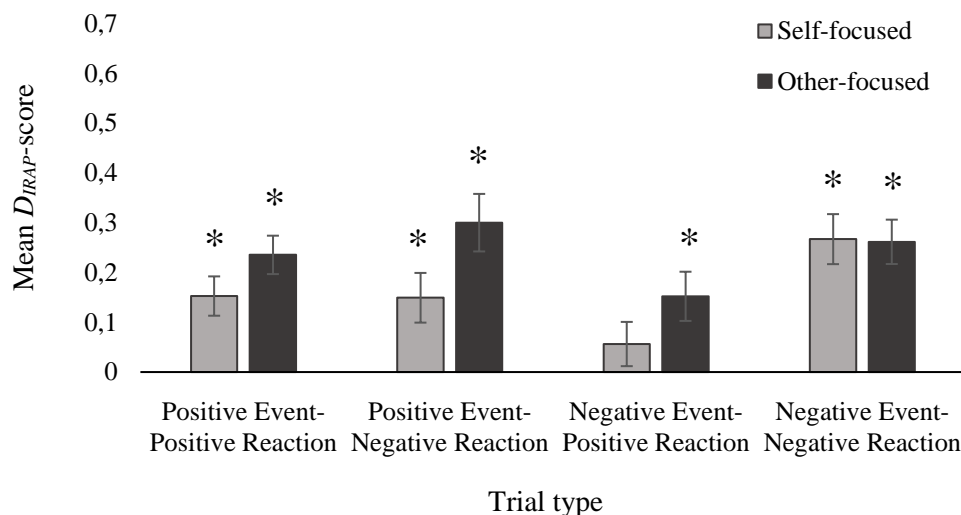

Fig. 4 Mean D_{IRAP}-scores on the self-focused and others-focused IRAP trial types in Experiment 2. **Positive D_{IRAP}-*scores* indicate history-consistent responding and negative D_{IRAP}-*scores* indicate history-inconsistent responding. *Indicates D_{IRAP}-scores that are significantly different from zero**

Table 4
Experiment 2 Fisher's PLSD Comparisons

Trial type	Mean Difference	p
Positive Event-Positive Reaction/ Positive Event–Negative Reaction	-0.03	.51
Positive Event- Positive Reaction/ Negative Event-Positive Reaction	0.09	.05
Positive Event- Positive Reaction/ Negative Event-Negative Reaction	-0.07	.13
Positive Event-Negative Reaction/ Negative Event- Positive Reaction	0.12	<.01*
Positive Event-Negative Reaction/ Negative Event- Negative Reaction	-0.04	.39
Negative Event-Positive Reaction/ Negative Event-Negative Reaction	-0.16	<.001*

* Indicates significant p values

Correlations. The overall *D*-score from each IRAP, as well as the difference scores between the two IRAPs, were subjected to correlational analyses with the questionnaires (i.e., 25 correlations for each IRAP and 25 for the IRAP difference score, not shown). The correlation matrix showed three significant correlations. The other-focused IRAP significantly correlated with the frequency of positive psychotic-like symptoms [$r(49) = -0.3, p < 0.04$], but did not do so after a Bonferroni correction. The other-focused IRAP also significantly correlated with the ECR-RS attachment-avoidance subscale for romantic partner [$r(49) = 0.34, p < 0.02$] and for mother [$r(49) = 0.31, p < 0.03$], but neither remained significant after Bonferroni corrections. There were no significant correlations with the IRAP difference score (all rs <.28 and all ps > .05). Finally, the overall *D*-scores from the two IRAPs were correlated and this single correlation proved to be significant ($r = 0.315$ and $p = 0.027$).

Summary. The results from Experiment 2 again indicated that the other-focused IRAP produced bias scores that were significantly stronger than the self-focused IRAP. Again, there was no significant interaction between IRAP type and trial type. Interestingly, the relatively large difference between the IRAPs for the *Negative Event-Negative Reaction* trial type that was observed in Experiment 1, was completely absent in Experiment 2, despite

the fact that Experiment 2 was a direct replication. The reason for the failure to replicate the

effect for this trial type remains unclear at this time. The reader should note that we also failed

to replicate this effect across the remaining four studies, and thus it is reasonable to conclude

that the effect observed in Experiment 1 was likely due to genuine error variance in the

sample. Only three of the 75 correlations proved to be significant, but did not remain so after

Bonferroni corrections, and thus should be interpreted with extreme caution. At this point,

therefore, the main effect for IRAP type had been replicated, in that the other-focused IRAP

produced larger positive D_{IRAP} effects relative to the self-focused IRAP. Differences between

the two IRAPs for individual trial types did not appear to be particularly important, in that

both experiments failed to yield even a trend towards a significant interaction, and the

relatively large difference in the IRAPs observed in Experiment 1 for the *Negative Event-*

Negative Reaction trial type was completely absent in Experiment 2. The lack of significant

correlations between the IRAPs and the questionnaires in both studies suggests that the

measures were not targeting behaviors that overlapped to any great degree. On balance

however, the overall *D*-scores from the two IRAPs did correlate in Experiment 2 (but not in

Experiment 1), suggesting some overlap in the two measures.

At this point in the research program, we thought it wise to begin to address the fact

that the other-focused IRAP produced stronger D_{IRAP}-scores than the self-focused IRAP. One

simple explanation for this difference might be that questions about how other people *in*

general react may tend to produce more stereotypical responding. That is, when the other is

unspecified, participants tend to produce responses that reflect some general view of other

people, rather than of a particular individual. In contrast, when responding to self, a range of

potentially important contextual variables may be involved. Thus, for example, when asked

how you as an individual react to positive events, there may be a tendency to confirm that in

general you react positively but that you are not the type of person to get overexcited, relative

to unspecified others. Similarly, an individual may confirm that they react negatively to

negative events, but not to the same degree, in general, as other people do. Insofar as this may

be the case, it is possible that an other-focused IRAP that specified a particular other would

produce a different result. The next experiment, therefore, was a systematic replication of

Experiments 1 and 2, but other was now specified and identified as someone who the

participant believed was "the person they are closest to". Identifying this person involved the

participant completing a bespoke specified other-focusing task, which is described

subsequently. Conducting a third experiment also allowed us to determine if we would

replicate the correlation between the two IRAPs found in Experiment 2, but not in Experiment

1. Finding such a correlation would undermine, to some extent, the argument that the two

IRAPs were targeting fundamentally different behavioral repertoires. The research remained

relatively exploratory and thus we did not make any formal predictions.

Experiment 3

Method

Participants. Forty participants were recruited for Experiment 3, 29 females, 10

males and one participant who identified as neither male nor female. Ages ranged from 18-45

years ($M = 22.67$). All participants were recruited through random convenience sampling

from Department of Experimental, Clinical and Health Psychology, Ghent University

participant pool and were paid an hourly rate of 10 euro.

Materials and apparatus. The self-focused IRAP was identical to that used in

Experiments 1 and 2. The other-focused IRAP was similar to the previous experiments,

except that the phrase "other people" was replaced with the name of a significant other

identified by each participant (e.g., "Sarah"). All questionnaires were identical to those used

in Experiment 2.

Specified other-focusing task. This task was designed to help ensure that all participants, in a broadly similar way, identified a significant other to whom they felt closest. The name of the person identified was then presented in the other-focused IRAP. Specifically, participants were asked to write down the name of the individual to whom they felt closest, followed by answers to six further questions about their relationship: 1. length of relationship, rated on Likert scale from 1 (*0-1 year*) to 4 (*10+ years*); 2. closeness of relationship (using one set of the IOS Venn diagrams and referring specifically to the name of the significant other); 3. frequency of contact, rated from 1 (*several times a day*) to 6 (*less than once a month*); 4. level of sharing personal information, rated from 1 ("*I share everything I possibly could*") to 5 ("*I share nothing about myself with this person*"); 5. warmth toward the significant other, on a thermometer from 0 ("*very cold toward the person*") to 100 ("*very warm toward the person*"); and 6. An open-ended description of the most pleasant event shared with this person. The scores on Questions 1-5 were combined and divided by 5 to provide an overall score for the specified other-focusing task, with higher scores indicating greater closeness in the relationship.

Self-focusing task. This task was also developed for the purpose of the current experiment, primarily to control for the extra 5 minutes it took to complete the specified other-focusing task. In this case, participants were simply asked to write down their own first name, followed by answers to five further questions: 1. List your top three hobbies; 2. How frequently do you engage in these hobbies, rated from 1 (*several times a day*) to 6 (*less than once a month*); 3. What is your favorite food; 4. Where is your favorite place; and 5. How warm do you feel toward yourself, from 0 (*very cold toward myself*) to 100 (*very warm toward myself*). Outcomes on this control task were not quantified.

Specified other-focused IRAP. The specified other-focused IRAP was identical to the other-focused IRAP used previously, except that each statement included the name of the individual from the specified other-focusing task (e.g., "Getting a fine makes *David* angry").

Self-focused IRAP. The self-focused IRAP was identical to the previous experiments.

Questionnaires. All questionnaires included in Experiment 3 were identical to Experiment 2.

Procedure. The procedure for Experiment 3 was similar to the procedure from the previous studies, except for the inclusion of the two focusing tasks before each IRAP. Experiment 3 comprised three phases: 1. specified other-focusing task and specified other-focused IRAP; 2. self-focusing task and self-focused IRAP; and 3. Questionnaires (CAPE, PFI, ECR-RS, EOS, IOS, and the Self-warmth Thermometer). The order of the presentation of Phases 1 and 2 was counterbalanced across participants.

Phase 1: Specified other-focusing task and specified other-focused IRAP. The researcher guided participants through the seven items of the specified other-focusing task in a semi-structured manner. Upon completion of the specified other-focusing task, participants were instructed as follows: "Before we begin the next task, I just want you to take a moment to think about [name of significant other]. The next phase of the experiment will be focused, in part, on this person." The specified other-focused IRAP was very similar to the other-focused IRAP from Experiment 2, except that each statement used the name of the significant other and participants were instructed as follows: "The program will present statements on the screen which refer to [name of significant other]. Please remember that when you see [name of significant other], this refers to [nature of the relationship, e.g., your best friend]".

Phase 2: Self-focusing task and self-focused IRAP. The researcher guided participants through the items of the self-focusing task also in a semi-structured manner. Participants were then instructed as follows: "The next task will contain statements about you.

Consider the statement, "If I win the lottery I feel happy". It is important to remember that the "I" we are referring to in this statement is you the participant. The procedure for the self-focused IRAP was identical to Experiment 2.

Questionnaires. Participants completed the questionnaires in the following sequence: the CAPE, PFI, ECR-RS, EOSS, IOS, and the Self-warmth Thermometer.

Results and Discussion

Questionnaire data. A summary of the means and standard deviations of each questionnaire and relevant subscales is provided in Appendix C. The overall pattern of results from the questionnaires was broadly similar to Experiment 2.

IRAP data. One participant failed the practice blocks on the specified other-focused IRAP; one failed to complete the self-focused IRAP because of limited time; three failed to maintain criteria on the self-focused IRAP; and two failed to do so on the specified other-focused IRAP. Thus, the final number of participants included in the analyses was $N = 33$.

***D*$_{IRAP}$-scores.** The mean D_{IRAP}-scores for each trial type are presented in Figure 5. Positive scores were recorded for all four trial types, with the weakest on *Negative Event-Positive Reaction*. For each of the four trial types, the difference between the two IRAPs appeared relatively modest. A 2x4 mixed repeated measures ANOVA produced a main effect for trial type [$F(1, 32) = 9.98$, $p < .001$, $\eta_\rho^2 = .24$], but not for IRAP type ($p > .8$), nor for the interaction ($p > 0.7$). Post-hoc (Fisher's PLSD) comparisons indicated that *Positive Event-Positive Reaction* differed significantly from the other three trial types, and *Negative Event-Positive Reaction* differed from *Positive Event-Negative Reaction* and from *Negative Event-Negative Reaction* (see Table 5).
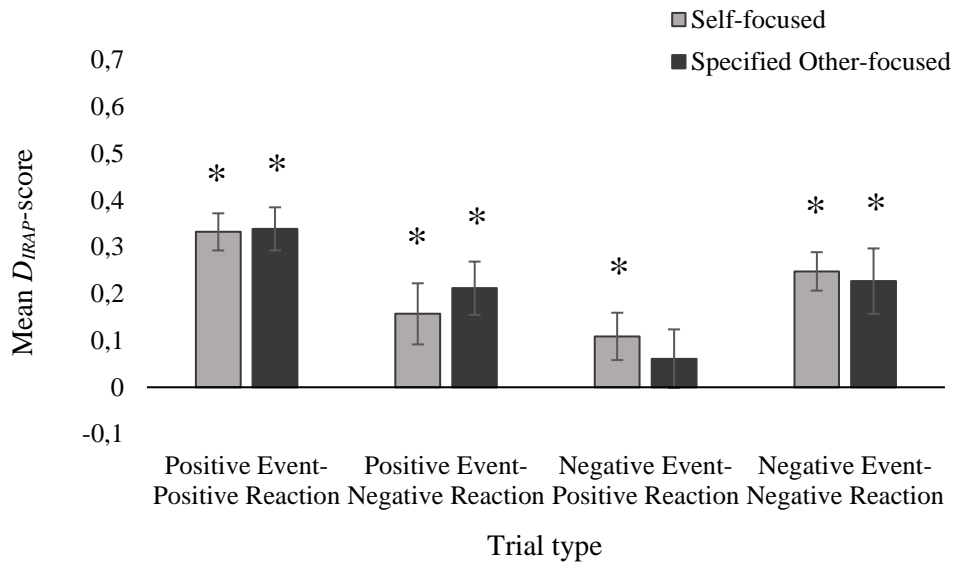
Fig. 5 Mean D_{IRAP}-scores on the self-focused IRAP trial types and specified other-focused trial types in Experiment 3. **Positive D_{IRAP}-scores indicate history-consistent responding and negative D_{IRAP}-scores indicate history-inconsistent responding.** *Indicates D_{IRAP}-scores that are significantly different from zero

Table 5
Experiment 3 Fisher's PLSD Comparisons

Trial type	Mean Difference	p
Positive Event-Positive Reaction/ Positive Event–Negative Reaction	0.15	<.01*
Positive Event- Positive Reaction/ Negative Event-Positive Reaction	0.25	<.0001 *
Positive Event- Positive Reaction/ Negative Event-Negative Reaction	0.1	<.04*
Positive Event-Negative Reaction/ Negative Event- Positive Reaction	0.1	<.03*
Positive Event-Negative Reaction/ Negative Event- Negative Reaction	-0.05	.31
Negative Event-Positive Reaction/ Negative Event-Negative Reaction	-0.15	<.001*

* Indicates significant *p* values.

Correlations. The overall *D*-score from each IRAP, as well as the difference scores between the two IRAPs, were subjected to correlational analyses (not shown) with the questionnaires (i.e., 25 correlations for each IRAP and 25 for the IRAP difference score). A correlation matrix showed four significant correlations. The self-focused IRAP correlated positively with frequency of negative psychotic-like symptoms [$r(33) = .38$, $p < 0.03$] and

with warmth towards oneself [$r(33) = .49, p < 0.01$]. The specified other-focused IRAP

correlated negatively with avoidant-attachment with one's mother [$r(33) = -.43, p < 0.01$].

The IRAP difference score correlated positively with avoidant-attachment with one's mother

[$r(33) = 0.41, p < 0.02$]. None of these correlations remained significant after Bonferroni

corrections. Finally, the overall D-scores from the two IRAPs were correlated and this single

correlation proved to be significant ($r = 0.414$ and $p = 0.016$).

Summary. In contrast to the two previous experiments, the difference for IRAP type

was non-significant in this third experiment. This suggests that when the other is specified,

participants respond in a broadly similar fashion to both self- and other-focused IRAPs. The

overall D-scores from the two IRAPs also correlated, suggesting some overlap in the two

measures. Only four of the 75 correlations proved to be significant but did not remain so after

Bonferroni corrections, and thus again should be interpreted with extreme caution. On

balance, Experiment 3 differed from the previous two experiments in two ways. That is,

Experiment 3 introduced a specified other, but also involved a focusing task designed to help

ensure that all participants identified, in a similar manner, with the significant other to whom

they felt closest. It is possible that completing this task before the IRAPs, in some undefined

way, undermined the differences in IRAP performances previously recorded in Experiments 1

and 2. In Experiment 4, therefore, we sought to replicate Experiment 3, which again involved

a specified other, but without exposure to the focusing tasks.

Experiment 4

Method

Participants. Thirty-four participants were recruited for Experiment 4, 21 females and

13 males. Ages ranged from 18-39 years old ($M = 22.64$). All participants were recruited

through random convenience sampling from the Department of Experimental, Clinical and

Health Psychology, Ghent University participant pool and were paid an hourly rate of 10 euro.

Materials and apparatus. Both IRAPs were identical to Experiment 3.

Procedure. The procedure was very similar to Experiment 3, except that the self-focusing and specified other-focusing tasks were no longer included. That is, participants were again asked to write down the name of the individual to whom they felt closest, but this was *not* followed by any questions about the nature of their relationship. Note also that no additional questions preceded the self-focused IRAP.

Results and Discussion

Questionnaire data. A summary of the means and standard deviations of each questionnaire and relevant subscales is provided in Appendix D. The overall pattern of results from the questionnaires was broadly similar to Experiment 3.

IRAP data. Three participants failed to maintain criteria on the self-focused IRAP and one failed to complete the self-focused IRAP because of time constraints. Thus, the final number of participants included in the analyses was $N = 30$.

D_{IRAP}-scores. The mean D_{IRAP}-scores and standard errors for each trial type for both IRAPs are presented in Figure 6. Positive scores were recorded for all four trial types, with the weakest observed for *Negative Event-Positive Reaction*. For each of the four trial types, the difference between the two IRAPs appeared relatively modest, except for *Positive Event-Negative Reaction*. A 2x4 repeated measures ANOVA yielded a significant main effect for trial type [$F(1, 29) = 10.99$, $p < .001$, $\eta_\rho^2 = .27$] but no main effect for IRAP type ($p > .8$) or the interaction ($p > .4$). Post-hoc (Fisher's PLSD) comparisons among the four trial types (see Table 6) indicated that *Negative Event-Positive Reaction* differed significantly from the other three trial types.
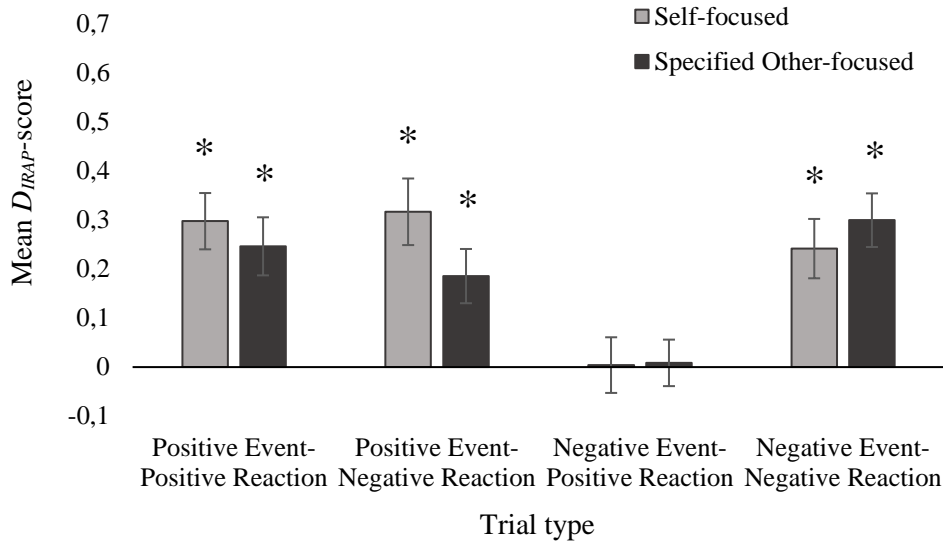
Fig. 6 Mean D_{IRAP}-scores on the self-focused IRAP trial types and specified other-focused trial types in Experiment 4. **Positive D_{IRAP}-scores indicate history-consistent responding negative D_{IRAP}-scores indicate history-inconsistent responding.** *Indicates D_{IRAP}-scores that are significantly different from zero

Table 6
Experiment 4 Fisher's PLSD Comparisons

Trial type	Mean Difference	p
Positive Event-Positive Reaction/ Positive Event–Negative Reaction	0.04	.49
Positive Event- Positive Reaction/ Negative Event-Positive Reaction	0.27	<.0001*
Positive Event- Positive Reaction/ Negative Event-Negative Reaction	- 0.01	.96
Positive Event-Negative Reaction/ Negative Event- Positive Reaction	0.23	<.0001*
Positive Event-Negative Reaction/ Negative Event- Negative Reaction	-0.04	.45
Negative Event-Positive Reaction/ Negative Event-Negative Reaction	-0.28	<.0001*

* Indicates significant *p* values.

Correlations. The overall *D*-score from each IRAP, as well as the difference scores between the two IRAPs, were subjected to correlational analyses with the questionnaires (i.e., 25 correlations for each IRAP and 25 for the IRAP difference score, not shown). A correlation matrix showed six significant correlations. The self-focused IRAP correlated positively with the EOSS close relationships-absent subscale [$r(30) = 0.47, p < 0.01$]. The specified other-focused IRAP correlated negatively with the ECR-RS attachment-avoidance subscale for

one's mother [$r(30) = -0.42$, $p < 0.05$], one's father [$r(30) = -.391$, $p < 0.04$], and with

attachment-anxiety of best friend [$r(30) = -0.38$, $p < 0.04$], and again with the overall PFI

score [$r(30) = -0.42$, $p < 0.03$]. The difference score between the IRAPs correlated negatively

with attachment-avoidance with romantic partner [$r(30) = -0.38$, $p < 0.04$]. None of these

correlations remained significant after Bonferroni corrections. Finally, the overall D-scores

from the two IRAPs were correlated and this single correlation proved to be non-significant (r

$= 0.284$ and $p = 0.129$).

     Summary. Similar to Experiment 3, the difference for IRAP type was again non-

significant, suggesting that when the other is specified, participants respond in a broadly

similar fashion to both self- and other-focused IRAPs. As a result, the lack of difference

between the IRAPs observed in Experiment 3 was unlikely due to the focusing tasks (because

in Experiment 4, these tasks were not included). However, the overall D-scores from the two

IRAPs did not correlate significantly (in Experiment 3 the correlation was significant),

suggesting no overlap in the two measures. Only six of the 75 correlations proved to be

significant but again these did not remain so after Bonferroni corrections.

     At this point in the research, the first two experiments had yielded significant

differences between the IRAPs when other was unspecified, but non-significant differences

were recorded across the third and fourth experiments when other *was* specified. In these

latter experiments, the specified other was identified as the person to whom each participant

was closest, and thus the variable of closeness, but not similarity, was manipulated. It is

possible, therefore, that the lack of significant differences between the self- and other-IRAPs

was not due to closeness but to similarity, if we assume that in general people are close to

others who are similar to them. In Experiment 5, therefore, we replicated Experiment 4, but

asked participants to identify an individual to whom they were close but who they perceived

to be very different: would targeting difference in this way produce a significant difference between the two IRAPs?

Experiment 5

Method

Participants. Thirty-two participants were recruited for Experiment 5, 24 females, eight males. Ages ranged from 18-32 years ($M = 20.82$). All participants were recruited through random convenience sampling from the Department of Experimental, Clinical and Health Psychology, Ghent University participant pool and were paid an hourly rate of 10 euro.

Materials and apparatus. The self-focused IRAP was identical to that used in Experiments 1-4. The other-focused IRAP was similar to Experiments 3 and 4, except that the name presented in each of the statements was now of a specified other (e.g., "Sarah") who the participant considered to be very different from them. All questionnaires were identical to those used in Experiments 2-4.

Specified other-focused IRAP. The specified other-focused IRAP was similar to Experiments 3 and 4, except that each statement now included the name of an individual to whom the participant was close, but who was nonetheless perceived to be very different. Participants were instructed as follows "I want you to think of a person in your life that you are close to, but who you also consider to be very different from you. For example, this could be a friend who has very different interests from you."

Self-focused IRAP. The self-focused IRAP was identical to all previous experiments.

Questionnaires. All questionnaires were identical to Experiments 2-4.

Procedure. The procedure was similar to Experiment 4, except that the specified-other IRAP involved the name of an individual to whom the participant was close, but who was perceived to be very different.

Results and Discussion

Questionnaire data. A summary of the means and standard deviations of each questionnaire and relevant subscales is provided in Appendix E. The overall pattern of results from the questionnaires was broadly similar to previous experiments.

IRAP data. One participant failed to complete the specified other-focused IRAP because of limited time and one failed to maintain criteria on the self-focused IRAP. Thus, the final number of participants included in the analyses was $N = 30$.

D_{IRAP}-**scores.** The mean D_{IRAP}-scores for each trial type are presented in Figure 7. Positive scores were recorded for all four trial types, with the weakest on *Negative Event-Positive Reaction*. For each of the four trial types, the difference between the two IRAPs appeared relatively modest. A 2x4 mixed repeated measures ANOVA produced a main effect for trial type [$F(1, 29) = 5.33$, $p < .001$, $\eta_\rho^2 = .16$], but not for IRAP type ($p > .5$), or for the interaction $p > 0.2$). Post-hoc (Fisher's PLSD) comparisons indicated that *Negative Event-Positive Reaction* differed significantly from *Positive Event-Positive Reaction* and *Negative Event-Negative Reaction* (see Table 7).
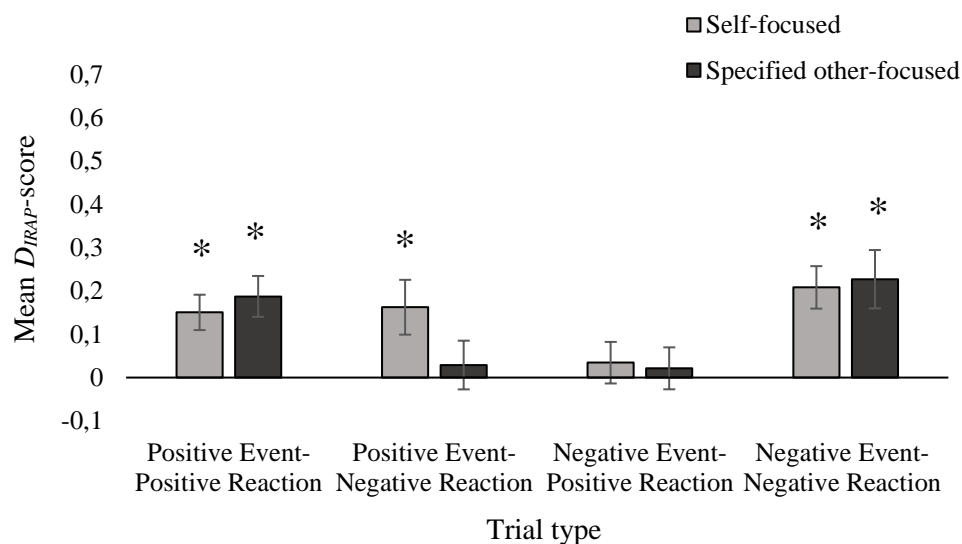

Fig. 7 Mean D_{IRAP}-scores on the self-focused IRAP trial types and specified other-focused trial types in Experiment 5. **Positive D_{IRAP}-scores indicate history-consistent responding and negative D_{IRAP}-scores indicate history-inconsistent responding.** *Indicates D_{IRAP}-scores that are significantly different from zero

Table 7
Experiment 5 Fisher's PLSD Comparisons

Trial type	Mean Difference	*p*
Positive Event-Positive Reaction/ Positive Event–Negative Reaction	.03	.51
Positive Event- Positive Reaction/ Negative Event-Positive Reaction	.12	.01*
Positive Event- Positive Reaction/ Negative Event-Negative Reaction	- .06	.2
Positive Event-Negative Reaction/ Negative Event- Positive Reaction	.09	.05
Positive Event-Negative Reaction/ Negative Event- Negative Reaction	-.09	.05
Negative Event-Positive Reaction/ Negative Event-Negative Reaction	-.18	<.0001*

* Indicates significant *p* values

Correlations. The overall *D*-score from each IRAP, as well as the difference scores

between the two IRAPs, were subjected to correlational analyses with the questionnaires (i.e.,

25 correlations for each IRAP and 25 for the IRAP difference score, not shown). A correlation

matrix showed only one significant correlation. The self-focused IRAP correlated negatively

with avoidant-attachment with one's mother [$r(30) = -.38, p < 0.04$], but again this was non-

significant after Bonferroni correction. In addition, the overall *D*-scores from the two IRAPs

were correlated and this single correlation proved to be significant ($r = 0.410$ and $p = 0.023$).

Summary. Similar to Experiments 3 and 4, the difference for IRAP type was again

non-significant, suggesting that when the other is known by the participant, but perceived as

different from them, participants respond in a broadly similar fashion to both self- and other-

focused IRAPs. The overall *D*-scores from the two IRAPs also correlated, suggesting some

overlap in the two measures. Only one of the 75 correlations proved to be significant but did

not remain so after a Bonferroni correction, and thus once again this result should be

interpreted very cautiously. In Experiments 3 and 4, the specified other was identified as the

person to whom each participant felt closest, but in Experiment 5 specified other was

identified as the person to whom each participant felt closest but perceived them as different.

It was assumed that people would feel positive towards others to whom they are close, and thus the variable of valence (i.e., positivity) was kept constant across these three experiments. It is possible, therefore, that the lack of difference in overall IRAP effects was not due to closeness and similarity, but to positive valence, if we assume that in general people feel positive toward those to whom they are close. In Experiment 6, therefore, we replicated Experiment 5, but asked participants to identify an individual who they knew but disliked: would targeting valence in this way produce a significant difference between the two IRAPs?

Experiment 6

Method

  Participants. Thirty-four participants were recruited for Experiment 6, 30 females, four males. Ages ranged from 18-50 years ($M = 21.29$). All participants were recruited through random convenience sampling from the Department of Experimental, Clinical and Health Psychology, Ghent University participant pool and were paid an hourly rate of 10 euro.

  Materials and apparatus. The self-focused IRAP was identical to that used in Experiments 1-5. The other-focused IRAP was similar to Experiments 3-5, except that the name presented in each of the statements was now of a specified other (e.g., "Sam") who the participant disliked. All questionnaires were identical to those used in Experiments 2-5.

  Specified other-focused IRAP. The specified other-focused IRAP was similar to Experiments 3-5, except that each statement now included the name of an individual who was known to the participant, but who they disliked. Participants were instructed as follows "I want you think of a person in your life who you often interact with, but who you don't like. For example, this could be a classmate, work colleague or family member who you do not get along with."

  Self-focused IRAP. The self-focused IRAP was identical to all previous experiments.

Questionnaires. All questionnaires were identical to Experiments 2-5.

Procedure. The procedure was similar to Experiment 5, except that the specified-other IRAP involved the name of an individual to whom the participant was close, but who they disliked.

Results and Discussion

Questionnaire data. A summary of the means and standard deviations of each questionnaire and relevant subscales is provided in Appendix F. The overall pattern of results from the questionnaires was broadly similar to previous experiments.

IRAP data. One participant failed to complete the specified other-focused IRAP because of limited time and two failed to maintain criteria on the specified other-focused IRAP. One participant failed to maintain criteria on the self-focused IRAP. Thus, the final number of participants included in the analyses was $N = 30$.

D_{IRAP}-scores. The mean D_{IRAP}-scores for each trial type are presented in Figure 8. Positive scores were recorded for seven of the eight trial types, with the only negative score recorded on *Negative Event-Positive Reaction* of the specified other-focused IRAP. For each of the four trial types, the difference between the two IRAPs appeared relatively modest. A 2x4 mixed repeated measures ANOVA produced a main effect for trial type [$F(1, 29) = 7.28$, $p < .001$, $\eta_\rho^2 = .2$], but not for IRAP type ($p > .09$), or for the interaction ($p > 0.46$). Post-hoc comparisons (Fisher's PLSD) indicated that *Negative Event-Positive Reaction* differed significantly from *Positive Event-Positive Reaction*, *Positive Event-Negative Reaction,* and *Negative Event-Negative Reaction* (see Table 8).
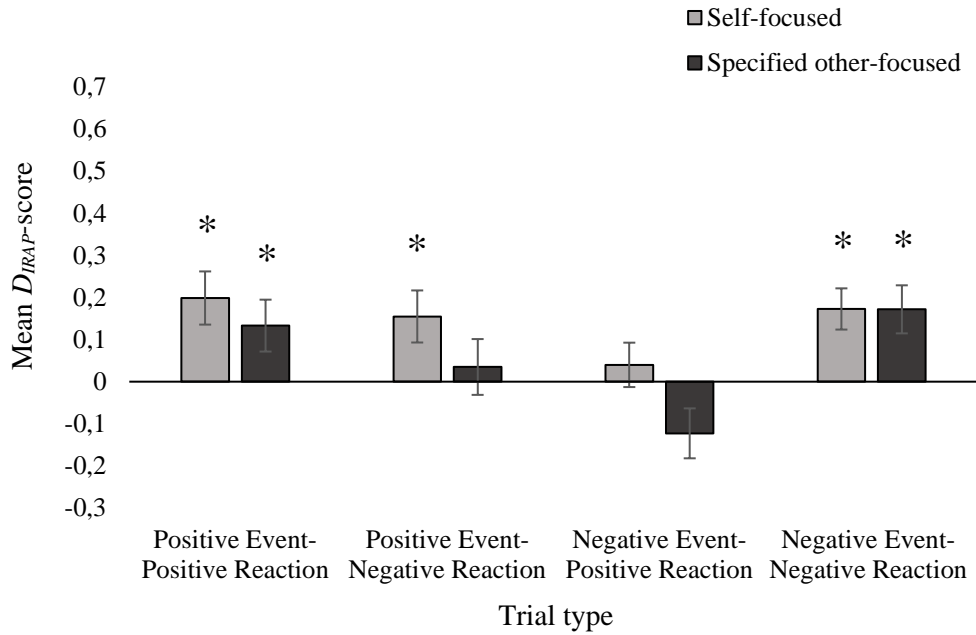
Fig. 8 Mean D_{IRAP}-scores on the self-focused IRAP trial types and specified other-focused trial types in Experiment 6. **Positive D_{IRAP}-scores indicate history-consistent responding and negative D_{IRAP}-scores indicate history-inconsistent responding.** *Indicates D_{IRAP}-scores that are significantly different from zero

Table 8
Experiment 6 Fisher's PLSD Comparisons

Trial type	Mean Difference	*p*
Positive Event-Positive Reaction/ Positive Event–Negative Reaction	.07	.18
Positive Event- Positive Reaction/ Negative Event-Positive Reaction	.21	<.01*
Positive Event- Positive Reaction/ Negative Event-Negative Reaction	- .0006	.90
Positive Event-Negative Reaction/ Negative Event- Positive Reaction	.14	<.02*
Positive Event-Negative Reaction/ Negative Event- Negative Reaction	-.08	.14
Negative Event-Positive Reaction/ Negative Event-Negative Reaction	-.21	<.01*

* Indicates significant *p* values.

Correlations. The overall *D*-score from each IRAP, as well as the difference scores

between the two IRAPs, were subjected to correlational analyses with the questionnaires (i.e.,

25 correlations for each IRAP and 25 for the IRAP difference score, not shown). The

correlation matrix yielded five significant correlations. The self-focused IRAP correlated

negatively with avoidant-attachment to one's romantic partner [$r(30) = -.41$, $p < 0.03$] and the control of a person close to them over the experience of self [$r(30) = -.43$, $p < 0.02$]. The specified-other IRAP correlated negatively with the control of a person close to them over the experience of self [$r(30) = -.39$, $p = 0.03$], closeness to other people [$r(30) = -.41$, $p = 0.03$], and with warmth towards oneself [$r(30) = -.46$, $p < 0.01$]. Once again, none of these correlations remained significant after Bonferroni corrections. Finally, the overall *D*-scores from the two IRAPs were correlated and this single correlation proved to be non-significant ($r = 0.103$, $p = 0.59$).

Summary. Similar to Experiments 3-5, the difference for IRAP type was again non-significant, suggesting that when the other is negatively valenced, participants again respond in a broadly similar fashion to both self- and other-focused IRAPs. On balance, the overall *D*-scores from the two IRAPs did not correlate significantly, suggesting limited overlap in the two measures. Once again, only a small number of the 75 correlations proved to be significant, but again these did not remain so after Bonferroni corrections.

General Discussion

The overarching purpose of the current series of experiments was to develop IRAPs that would clearly differentiate responding from the perspective of self versus other. Previous research appeared to demonstrate deictic relational responding using the IRAP (i.e., responding to the characteristics of self versus other within an IRAP), but to date clear evidence of responding from the perspective of self versus from the perspective of another has not been shown. To demonstrate such an effect would seem to require inserting statements into an IRAP that ask participants to confirm and deny how the self versus others would react to similar events. Achieving this objective required that relatively complex statements be employed, and for this reason a natural language version of the IRAP was used. The results from the first two experiments reported here indicated that there were significant differences

between the self- versus other-focused IRAPs, when the other remained unspecified. The

remaining four experiments, however, indicated that when the other was specified there was

limited evidence that performances on the two IRAPs differed significantly. The correlational

analyses between the IRAPs and the self-report measures yielded very few significant effects

(and none at all after Bonferroni corrections). Finally, the correlational analyses between the

two IRAPs in each experiment were significant in some cases (Experiments 2, 3, and 5), but

not others (Experiments 1, 4, and 6). Overall, the relatively small number of uncorrected

correlations between the IRAPs and the explicit measures, and the complete absence of any

corrected significant correlations, suggest that such effects should be taken with extreme

caution, and at the current time they are, in our view, not worthy of further discussion. The

reader is referred to Table 9 for a summary of the main findings arising from the six studies

presented here.

Table 9

Summary of the main findings for the six experiments

Experiment	Difference in overall *D-IRAP* score between Self and Other IRAPs	IRAPs Correlated	Correlations between IRAPs and self-reports (uncorrected)	Corrected Correlations
Experiment 1 Self and Unspecified Other	Yes	No	IRAP difference score with CAPE (positive symptoms/frequency) [$r(37) = 0.34, p = 0.039$]	None
Experiment 2 Self and Unspecified Other	Yes	$r (49) = 0.315,$ $p = 0.027$	Other-focused IRAP with CAPE (positive symptoms/frequency) [$r(49) = -0.3, p < 0.04$] Other-focused IRAP with ECR-RS attachment-related avoidance subscale for romantic partner [$r(49) = 0.34, p < 0.02$] and for mother [$r(49) = 0.31, p < 0.03$]	None
Experiment 3 Self and Specified Other (closest to), with focusing task	No	$r (33) = 0.414,$ $p = 0.016$	Self-focused IRAP with CAPE (negative symptoms/frequency) [$r(33) = 0.38, p < 0.03$] and with Self-warmth Thermometer [$r(33) = 0 .49, p < 0.01$] Specified other-focused IRAP with ECR-RS attachment-related avoidance subscale for one's mother [$r(33) = -0.43, p < 0.01$] IRAP difference score with ECR-RS attachment-related avoidance for one's mother [$r(33) = 0.41, p < 0.02$]	None
Experiment 4 Self and Specified Other (closest to), without focusing task	No	No	Self-focused IRAP with EOSS close relationships-absent subscale [$r(30) = 0.47, p < 0.01$] Specified other-focused IRAP with ECR-RS attachment-related avoidance subscale for one's mother [$r(30) = -0.42, p < 0.05$] one's father [$r(30) = -0.391, p < 0.04$] with ECR-RS attachment-related anxiety subscale for best friend [$r(30) = -0.38, p < 0.04$]	None

			and with the overall PFI score [$r(30) = -0.42, p < 0.03$]	
			IRAP difference score with ECR-RS attachment-related avoidance subscale for romantic partner [$r(30) = -0.38, p < 0.04$]	
Experiment 5 Self and Specified Other (dislike)	No	$r(30) = 0.410$, $p = 0.023$	Self-focused IRAP with ECR-RS attachment-related avoidance subscale for one's mother [$r(30) = -0.38, p < 0.04$]	None
Experiment 6 Self and Specified Other (different from)	No	No	Self-focused IRAP with ECR-RS attachment-related avoidance subscale for romantic partner [$r(30) = -0.41, p < 0.03$]	None
			and with the EOSS close relationships-present subscale [$r(30) = -0.43, p < 0.02$]	
			Specified-other IRAP with the EOSS close relationships-present subscale [$r(30) = -0.39, p = 0.03$]	
			IOS for best friend [$r(30) = -0.41, p = 0.03$]	
			and with the Self Warmth Thermometer [$r(30) = -0.46, p < 0.01$]	

Overall, the current findings could be seen as encouraging because each experiment produced performances that would be deemed consistent with the pre-experimental histories of the participants. That is, the IRAP effects for the most part, were in the predicted direction (e.g., participants confirmed more rapidly than they denied that when positive events occur, they react positively, but when negative events occur, they react negatively). The results were also encouraging because we observed a possibly important distinction in perspective-taking when it applied to a general unspecified other versus someone well known to the participant (see DeBernardis, Hayes, & Fryling, 2014).

On balance, the results could be seen as somewhat disappointing because we failed to find strong evidence of perspective-taking when other was specified, at least in terms of different performances across the two IRAPs, or in correlations among the IRAPs and the self-report measures. Nonetheless, we think it is important to report the data at this point because they may be instructive for other researchers seeking to develop IRAP-based, or even latency-based, measures of perspective-taking. We do recognize, of course, that it would be possible to analyze the current dataset in almost countless ways, using a variety of statistical techniques, thus yielding, perhaps, less disappointing outcomes. To do so, however, would not link directly back to the conceptual assumptions on which the current research was based.

One unexpected pattern that did emerge, and which was generally consistent across all six experiments, was that the trial type *Negative Event-Positive Reaction* tended to yield the weakest effect. The extent to which this could be explained in terms of a Single Trial-Type Dominance Effect (STTDE), as reported by Kavanagh et al. (2018; see also Finn et al., 2018), cannot readily be applied here because that effect is specific to the two trial types that require a "Yes" response during history-consistent blocks. The critical issue here is that across all six experiments the effect for the *Negative Event-Positive Reaction* was weaker than for the *Positive Event-Negative Reaction* trial type, and both of these trial types require a "No"

response during history-consistent blocks. Why would they differ, given that they both require the same response within blocks?[2] This question seems particularly interesting because a natural language format IRAP was employed here, and thus an explanation that appeals to the functions of separate label and target stimuli within a traditional IRAP cannot be applied (see Kavanagh et al., for a detailed discussion). Nevertheless, given the consistency in this weakness effect for the *Negative Event-Positive* trial-type, across the six studies, it remains a pattern that should be targeted for systematic analyses in future research.

Irrespective of the explanation for the unexpected differential D-$_{\text{IRAP}}$ effects for the two trial types discussed above, overall the two IRAPs did produce history-consistent effects. In this sense, the IRAPs produced predictable outcomes and thus it seems important, going forward, to ask why the IRAPs did not distinguish in a clear and consistent way between the perspective of self versus other. One possibility is that the IRAPs simply tapped into "sense-making." For example, confirming, rather than denying that positive events evoke positive reactions in the self and others makes sense in natural language. The only caveat to this interpretation is that significant differences between the IRAPs were observed in Experiments 1 and 2 when the other was unspecified, but not in Experiments 3-6 when other was specified. Perhaps, therefore, there was some sensitivity to self versus other, but the use of complex statements in the IRAPs potentially undermined or reduced the impact of deictic relational responding per se. That is, in presenting such complex stimuli or networks in the IRAP, participants more or less interpreted the task as a sense-making or problem-solving task, in which the self versus other had little or no impact, particularly when the other was specified.

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[2] As noted above, this difference across the trial types was not expected and thus any analysis or discussion of this finding must remain entirely post-hoc. We decided to employ both regular t-tests and Bayesian paired t-tests, one for each IRAP, because when the data were collapsed across all six experiments the Ns were relatively large (total $N = 209$) and thus the likelihood of obtaining significant p values increases dramatically. The results for both tests were significant with extremely strong evidence from the Bayes analyses: self-focused IRAP (*Positive Event-Negative Reaction*; $M = .185$, $SD = 0.345$, *Negative Event-Positive Reaction*, $M = .049$, $SD = .293$, $t(208) = 5.202$, $p < .001$, 95% CI [.084, .187], BF1 = 43939); other-focused IRAP (*Positive Event-Negative Reaction*; $M = .231$, $SD = 0.341$, *Negative Event-Positive Reaction*, $M = .074$, $SD = .329$, $t(208) = 5.747$, $p < .001$, 95% CI [.103, .210], BF1 = 578829).

The challenge going forward, therefore, is to develop IRAPs that maintain the deictic functions of self and other, in the context of perspective-taking rather than simple sense-making. One way in which we are currently pursuing this is to revert to the more traditional label-target format within the IRAP, but to present pictures of each participant versus matched pictures of another individual (to maintain the differential functions of self versus other). The general idea, therefore, is to reduce the complexity of the relational networks, while maintaining the distinction between self and other.

In closing, we think it is important to draw attention to a pattern in the data that only came to light during the review process, and that might indicate that the two IRAPs may have been sensitive, to some degree, to self versus others, when other was clearly distinct from self. Specifically, the trial type effect for *Positive Event-Negative Reaction* was significantly different from zero for the self-focused IRAPs, but not for the other-focused IRAPs, across Experiments 5 and 6. This was not the case in the four remaining experiments, in which other was unspecified or specified as similar to self. In a purely post-hoc analysis, we compared the difference between the self- and other-focused IRAPs for the *Positive Event-Negative Reaction* trial type, (Self; $M = .164$ $SD = .324$, Other; $M = .032$ $SD = .333$, $t(59) = 2.195$ $p =.032$. 95% CI [.024, .54], BF1 = 2.560). We raise this issue here because this pattern emerged across the two experiments in which other was clearly distinct from self. If this finding is indeed robust, it could indicate that participants found it easier to respond 'False' when self, rather than a very distinct other, was coordinated in some way with a negative reaction. In simple terms, participants showed a bias toward denying that they are negative that was stronger than that bias for very different others. Although subtle, pursuing this potentially interesting effect could be useful in future research.

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Appendix A

Experiment 1: Descriptive statistics for questionnaires

Questionnaire	M	SD
Acceptance and Action Questionnaire (AAQ-II)	17.16	7.14
CAPE (weighted scores)		
Overall Frequency	1.5	.19
Frequency of Positive Symptoms	1.32	.23
Frequency of Negative Symptoms	1.57	.34
Frequency of Depressive Symptoms	1.83	.41
Overall Distress	2.04	.45
Distress associated with Positive Symptoms	1.68	.53
Distress associated with Negative Symptoms	2.13	.86
Distress associated with Depressive Symptoms	2.33	.62

Note: The maximum weighted score for all CAPE subscales is 4.00. The CAPE has no formal clinical cut-off. The maximum score for the AAQ-II is 49 and the measure has a suggested clinical cut-off of ≥ 24.

Appendix B

Experiment 2: Descriptive statistics for questionnaires

Questionnaire	M	SD
Self-warmth Thermometer	56.65	22.02
Psychological Flexibility Index (PFI)	355.31	27.19
CAPE (weighted scores)		
Overall Frequency	1.72	.32
Frequency of Positive Symptoms	1.43	.34
Frequency of Negative Symptoms	1.94	.44
Frequency of Depressive Symptoms	2.08	.52
Overall Distress	2.15	.54
Distress associated with Positive Symptoms	1.66	.44
Distress associated with Negative Symptoms	2.07	.58
Distress associated with Depressive Symptoms	2.54	.73
ECR-RS		
Attachment-related avoidance (Mother)	19.82	9.47
Attachment-related anxiety (Mother)	5.33	3.51
Attachment-related avoidance (Father)	23.65	9.55
Attachment-related anxiety (Father)	6.41	4.61
Attachment-related avoidance (Partner)	11.45	5.55
Attachment-related anxiety (Partner)	9.02	4.79
Attachment-related avoidance (Best Friend)	14.12	6.33
Attachment-related anxiety (Best Friend)	7.69	4.6
EOSS		
Overall EOSS	72.82	15.97
Casual Acquaintances-absent	17.47	5.3
Casual Acquaintances-present	23.98	4.54
Close relationships-absent	11	6.19
Close relationships - present	20.38	6.02
IOS		
Best Friend	4.71	1.34
Other people	2.98	1.13

Note: The maximum score is 100 for the Self-warmth Thermometer. The maximum score for the PFI is 492. The maximum weighted score for all CAPE subscales is 4.00. The maximum score for each of the EC-RS attachment related avoidance subscales is 42 and the Attachment related anxiety subscale is 21. The maximum overall EOSS score is 140 with the maximum score for each subscale at 35. Finally, the maximum score for each of the IOS scales is 7. None of the scales have formal clinical cut-offs.

Appendix C

Experiment 3: Descriptive statistics for questionnaires

Questionnaires	M	SD
Self-warmth Thermometer	53.54	22.77
Psychological Flexibility Index (PFI)	323.42	23.99
Overall Other-focusing Task score	24.94	3.18
CAPE (weighted scores)		
Overall Frequency	1.71	.44
Frequency of Positive Symptoms	1.39	.4
Frequency of Negative Symptoms	1.93	.54
Frequency of Depressive Symptoms	2.09	.62
Overall Distress	2.09	.58
Distress associated with Positive Symptoms	1.66	.51
Distress associated with Negative Symptoms	2.06	.55
Distress associated with Depressive Symptoms	2.35	.93
ECR-RS		
Attachment-related avoidance (Mother)	18.24	9.75
Attachment-related anxiety (Mother)	4.56	2.75
Attachment-related avoidance (Father)	22.52	8.64
Attachment-related anxiety (Father)	5.52	3.89
Attachment-related avoidance (Partner)	11.61	4.61
Attachment-related anxiety (Partner)	9.21	5.18
Attachment-related avoidance (Best Friend)	13.88	4.61
Attachment-related anxiety (Best Friend)	6.91	4.03
EOSS		
Overall EOSS	75.7	13.28
Casual Acquaintances-absent	17.33	5.53
Casual Acquaintances-present	24.97	4.83
Close relationships-absent	10.82	5.57
Close relationships – present	22.58	5.04
IOS		
Best Friend	5.06	1.14
Other people	3.24	1.0

Note: See note for Appendix B

Appendix D

Experiment 4: Descriptive statistics for questionnaires

Questionnaire	M	SD
Self-warmth Thermometer	49.73	24.41
Psychological Flexibility Index (PFI)	346.73	24.64
CAPE (weighted scores)		
Overall Frequency	1.53	.38
Frequency of Positive Symptoms	1.33	.35
Frequency of Negative Symptoms	1.81	.49
Frequency of Depressive Symptoms	1.75	.52
Overall Distress	1.83	.55
Distress associated with Positive Symptoms	1.48	.65
Distress associated with Negative Symptoms	1.81	.61
Distress associated with Depressive Symptoms	2.16	.69
ECR-RS		
Attachment-related avoidance (Mother)	16.57	7.99
Attachment-related anxiety (Mother)	4.5	2.7
Attachment-related avoidance (Father)	23.93	10.3
Attachment-related anxiety (Father)	6.97	5.8
Attachment-related avoidance (Partner)	11.1	4.71
Attachment-related anxiety (Partner)	8.23	4.88
Attachment-related avoidance (Best Friend)	12.83	5.32
Attachment-related anxiety (Best Friend)	6.1	3.47
EOSS		
Overall EOSS	72.37	16.65
Casual Acquaintances-absent	16.6	4.97
Casual Acquaintances-present	23.33	4.72
Close relationships-absent	12.53	6.46
Close relationships - present	19.9	6.49
IOS		
Best Friend	4.3	1.09
Other people	2.7	1.08

Note: See note for Appendix B

Appendix E

Experiment 5: Descriptive statistics for questionnaires

Questionnaire	*M*	*SD*
Self-warmth Thermometer	47.43	27.18
Psychological Flexibility Index (PFI)	358.1	23.93
CAPE (weighted scores)		
Overall Frequency	1.76	.36
Frequency of Positive Symptoms	1.46	.28
Frequency of Negative Symptoms	1.97	.53
Frequency of Depressive Symptoms	2.13	.59
Overall Distress	2.15	.47
Distress associated with Positive Symptoms	1.7	.5
Distress associated with Negative Symptoms	2.45	.77
Distress associated with Depressive Symptoms	2.01	.56
ECR-RS		
Attachment-related avoidance (Mother)	17.9	7.9
Attachment-related anxiety (Mother)	6.13	3.5
Attachment-related avoidance (Father)	24.03	9.26
Attachment-related anxiety (Father)	8.3	5.37
Attachment-related avoidance (Partner)	12.03	5.51
Attachment-related anxiety (Partner)	10.33	5.2
Attachment-related avoidance (Best Friend)	14.07	6.03
Attachment-related anxiety (Best Friend)	7.73	4.17
EOSS		
Overall EOSS	74.93	14.96
Casual Acquaintances-absent	17.27	6.25
Casual Acquaintances-present	24.63	4.25
Close relationships-absent	12.03	5.73
Close relationships – present	21	6.26
IOS		
Best Friend	4.43	1.25
Other people	2.7	1.06

Note: See note for Appendix B

Appendix F

Experiment 6: Descriptive statistics for questionnaires

Questionnaire	*M*	*SD*
Self-warmth Thermometer	49.91	26.2
Psychological Flexibility Index (PFI)	363.13	25.44
CAPE (weighted scores)		
Overall Frequency	1.86	.37
Frequency of Positive Symptoms	1.62	.41
Frequency of Negative Symptoms	1.98	.45
Frequency of Depressive Symptoms	2.23	.49
Overall Distress	2.24	.46
Distress associated with Positive Symptoms	1.84	.49
Distress associated with Negative Symptoms	1.99	.52
Distress associated with Depressive Symptoms	2.72	.57
ECR-RS		
Attachment-related avoidance (Mother)	16.07	8.93
Attachment-related anxiety (Mother)	4.83	3.13
Attachment-related avoidance (Father)	23.07	10.70
Attachment-related anxiety (Father)	6.17	4.69
Attachment-related avoidance (Partner)	11.07	4.28
Attachment-related anxiety (Partner)	9.2	4.77
Attachment-related avoidance (Best Friend)	11.77	4.94
Attachment-related anxiety (Best Friend)	6.1	4.11
EOSS		
Overall EOSS	76.6	15.07
Casual Acquaintances-absent	18.23	5.35
Casual Acquaintances-present	25.77	3.53
Close relationships-absent	11.67	6.42
Close relationships - present	20.93	6.38
IOS		
Best Friend	5.10	1.40
Other people	3.13	1.22

Note: See note for Appendix B