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Are we Really Measuring Empathy? Proposal for a New Measurement Framework.

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1 **Abstract**

2 Empathy - currently defined as the sharing of another's affective state - has been the
3 focus of much psychological and neuroscientific research in the last decade, much of which has
4 been focused on ascertaining the empathic ability of individuals with various clinical conditions.
5 However, most of this work tends to overlook the fact that empathy is the result of a complex
6 process requiring a number of intermediate processing steps. It is therefore the case that
7 describing an individual or group as 'lacking empathy' lacks specificity. We argue for an
8 alternative measurement framework, in which we explain variance in empathic response in terms
9 of individual differences in the ability to identify another's emotional state ('emotion
10 identification'), and the degree to which identification of another's state causes a corresponding
11 state in the self ('affect sharing'). We describe how existing empathy paradigms need to be
12 modified in order to fit within this measurement framework, and illustrate the utility of this
13 approach with reference to examples from both cognitive neuroscience and clinical psychology.

14 **Keywords:** Empathy; affect sharing; emotion identification; neuroscience; model;
15 theory; definition.

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Highlights

- Empathy is currently defined as sharing the state of another.
- This definition conflates the identification and the sharing of another's state.
- Describing change or impairment in empathy therefore lacks specificity.
- We show how this can be problematic for popular paradigms in social neuroscience.
- And propose an alternative measurement framework to resolve this issue

30 **1 Introduction**

31 Empathy is commonly understood to be a complex psychological construct that plays a
32 crucial role in social interaction. As with many complex constructs, several overlapping but
33 distinct definitions of empathy have been suggested (Batson, 2009; Cuff, Brown, Taylor, & Howat,
34 2016). While there is as yet no consensus as to the precise definition of empathy, most
35 researchers (at least in the field of cognitive neuroscience and psychology) agree that empathy
36 involves the adoption of another's affective state so that both the Empathizer and the empathic
37 target (henceforth 'Target') are in a similar state (Cuff et al., 2016; Decety & Jackson, 2004; de
38 Vignemont & Singer, 2006; de Waal, 2008; Zaki & Ochsner, 2012; Shamay-Tsoory, Aharon-Peretz
39 & Perry, 2009). This notion of sharing the affective state of another forms the core of what we
40 shall refer to as the standard definition of empathy.

41 Empathy has received considerable research attention in the last decade, with a particular
42 focus on its neural instantiation permitted by improvements in human functional neuroimaging
43 (Lamm, Bukowski, & Silani, 2016; Shamay-Tsoory, 2011; Singer & Lamm, 2009; Zaki & Ochsner,
44 2012). Establishing the neural networks underlying empathy can elucidate the relationship
45 between self- and other-related affective experiences, provide information about the functional
46 processes involved in empathy, and suggest interventions to modulate levels of empathy
47 wherever desired.

48 Despite several leading theoretical models arguing for a multi-factorial structure of
49 empathy (Davis, 1980; Decety & Jackson, 2004; Decety & Meyer, 2008; Preston & de Waal, 2002),
50 there have been surprisingly few efforts to develop exhaustive information processing models to
51 detail the different processing stages involved in producing an empathic response. One

52 consequence of this is that it becomes difficult to determine the locus of any effect that
53 influences the empathic response. Without consideration of the contribution of those processes
54 upon which empathy relies, one cannot be sure that any effect is on empathy *per se*, or on a
55 computational precursor. Here, it will be argued that empathy relies upon, but is distinct from,
56 the ability to identify the emotional state of the Target (Bird & Viding, 2014; Happé, Cook, & Bird,
57 2017). The implication of this distinction between empathy and emotion identification for past
58 and future research will be discussed by showing that failing to distinguish these two constructs
59 could interfere with the correct interpretation and measurement of differences in empathic
60 responses associated with experimental manipulations or clinical conditions. Distinguishing
61 between emotion identification and empathy necessarily requires refinement of at least the
62 standard measurement framework for empathy, and possibly the definition of empathy itself.

63

64 **2 Current issues with the measurement of empathy**

65 Under the standard definition, for empathy to have occurred, the Empathizer must be in
66 a similar affective state to the Target. It therefore necessarily follows that in order to
67 demonstrate an empathic response, the Empathizer must be able to identify the Target's
68 affective state accurately, and identification of the Target's state must cause the Empathizer to
69 share this state. Under the standard definition of empathy therefore, the Empathizer can only be
70 considered empathic if they correctly **identify and share** the Target's emotion. Conversely, in
71 cases where the Empathizer does not identify the Target's state accurately, irrespective of
72 whether the Empathizer shares the state they judge the Target to be in, they cannot fulfil the
73 standard definition of empathy (Bird & Viding, 2014).

74 Under the standard definition then, empathy is a state one enters into as a consequence
75 of at least two processes (emotion identification and affect sharing): and empathy is just one
76 possible outcome of these two processes (for example, any inaccuracy of emotion identification
77 will result in a non-matching state). How then, should one conceptualize individual differences in
78 empathy? If empathy refers to the outcome of two processes, and, if either of these processes is
79 not functioning perfectly the outcome does not meet the definition of empathy, then what does
80 it mean to be less empathic? It is true that the affective state which arises as a consequence of
81 these two processes can be more or less like the state of the other. However, any state deviating
82 from the matching state does not meet the definition of empathy. Under the standard 'matching
83 state' definition therefore, empathy is binary – it either occurs or does not. This definition is
84 incompatible with the common understanding of empathy, in which it is acknowledged that there
85 can be varying degrees of empathy and that individuals or groups can be more or less empathic.
86 Despite this, we shall continue to use the term empathic response to refer to the outcome of the
87 emotion identification and affect sharing processes as it is the term most commonly used in the
88 literature.

89 As can be seen then, to describe an individual or group as 'less empathic' is problematic
90 when empathy is defined as a state. However, even if this problem is overlooked, the fact that
91 empathy is the product of two processes means that one can be 'less empathic' either because
92 one has misidentified the Target's state, or because even though the Target's state has been
93 correctly identified, one does not share the Target's state. This is an unsatisfactory situation as,
94 according to current usage, the notion of 'impaired empathy' conflates two processes: the
95 identification of the Target's state, and the sharing of the Target's state. These processes

96 contribute independent variance to the empathic response and can be independently affected
97 in clinical conditions. Furthermore, it is likely that a clinical group characterized by reduced
98 empathy due to poor emotion identification will need a different intervention than a group also
99 characterized by reduced empathy, but where this is due to reduced affect sharing.

100 It seems that there are two possible solutions to this problem: The first is that we continue
101 to use the standard definition of empathy as the outcome of two processes but we do not refer
102 to individual or group differences in empathy; rather we specify whether any individual
103 differences, experimental manipulations, or clinical conditions impact emotion identification,
104 affect sharing or both. This solution has the benefit of keeping the standard definition of
105 empathy, but dissociates the concept of empathy from measurement of the processes giving rise
106 to the empathic response. The second solution is to redefine empathy such that rather than the
107 outcome of a process it becomes the process of affect sharing itself; however, it would be
108 measured not as the degree to which the Empathizer's state matches that of the Target, but
109 rather the degree to which the Empathizer's state matches that identified in the Target (which
110 may deviate from the Target's actual state). This solution has the benefit that it becomes
111 meaningful to discuss individual differences in empathy (because empathy is no longer binary),
112 and individual differences in empathy are directly related to the measurement of a single process
113 rather than a conflation of two processes. A drawback of the new definition is that it deviates
114 both from the long tradition of existing work on empathy using the standard definition, and from
115 the popular understanding of empathy. While either approach is logically coherent, it should be
116 noted that the implications for the measurement of empathy that are outlined below are the
117 same whichever option is chosen. The first solution is relatively easy to implement and the

118 section "*Implications for paradigms used in basic and clinical studies of empathy*" will describe
119 how this can be done within existing empathy paradigms. The second solution is more radical
120 and therefore we have not pursued it further here, but note that adoption of this definition may
121 be worthy of consideration by the field in future.

122

123 **3 Defining and measuring emotion identification and affect**

124 **sharing**

125 We consider emotion identification to be the process of attributing an emotion to an
126 individual (note that this need not be a conscious attribution) which is agnostic as to the method
127 by which the attribution is made - it can be based on observable perceptual cues, but also
128 includes identification of an individual's state based on contextual information or inferential
129 reasoning. As such, it encompasses the stages of emotion perception, recognition and
130 categorization (see Schirmer & Adolphs, 2017 for a definition of these concepts). The accuracy of
131 emotion identification is therefore defined as the degree to which the Empathizer's judgement
132 of the state of the Target matches the Target's actual state (Figure 1- top panel). Specific methods
133 for measuring emotion identification are outlined below, but it is immediately apparent that an
134 individual may vary in their ability to identify another's emotion depending on the cues available
135 to them and on the context the Target is in. For example, an Empathizer with a specific problem
136 with the recognition of emotional facial expressions may be very inaccurate in identifying the
137 Target's state when the Target's facial expression is the only information the Empathizer has to
138 make their judgement, but be much more accurate if they know the situation the Target is in and

139 have been in a similar situation. The processes contributing to emotion identification will also be
140 recruited to explain and predict behaviour without necessarily evoking an emotional response,
141 but here we are interested in their role in producing an empathic response.

142 Affect sharing describes the process whereby identification of another's state causes that
143 state to be instantiated in the self. Individual differences in affect sharing would be described by
144 differences in the function mapping the state elicited in the Empathizer as a result of their
145 judgement of the Target's emotional state (not the Target's actual state; see Figures 1 [bottom
146 panel] and 2). For example, if the affect sharing function can be described as a simple ratio (note
147 that more complicated functions are possible, and even probable - see Figure 2), then an
148 individual with a ratio of 2:1 (emotion identified in the other : emotion elicited in the self), would
149 be described as having a greater degree of affect sharing than an individual for whom the ratio is
150 3:1. This is because, given that they both identify the same state in the Target, the state elicited
151 in the former individual will be greater than the state elicited in the latter individual. Affect
152 sharing may be described as more or less accurate on the basis of the degree of correspondence
153 between the state of the Target identified by the Empathizer and the empathic response elicited
154 in the Empathizer. A high degree of correspondence indicates a high degree of accuracy, whereas
155 'too much' affect sharing is indicated when the state elicited in the Empathizer by their
156 judgement of the Target's state is more extreme than the state attributed to the Target
157 (described by a ratio of 1:2 using the example above). This ratio describes affect sharing ability
158 independently of potential differences in emotion identification, such that individuals with a
159 similar ratio can be deemed to have similar degrees of affect sharing regardless of their ability to
160 identify another's emotion.

161 Using these conceptualizations of emotion identification and affect sharing, an empathic
162 response (state) is the product of emotion identification and an individual's degree of affect
163 sharing; separate processes that contribute independent variance. For two individuals who have
164 the same degree of affect sharing, i.e. their empathic response will be identical given that they
165 identify the same affective state in another, any difference in their empathic response will reflect
166 differences in their judgement of the Target's emotion (emotion identification). Conversely, for
167 two individuals equally good at identifying the state of the Target, any difference in the degree
168 of empathic response elicited will be due to differences in their degree of affect sharing (Figure
169 3).

170 The importance of measuring, and distinguishing between, emotion identification and
171 affect sharing, is illustrated by the following, somewhat artificial, thought experiment. Consider
172 the case of a parent who sees their child injured and in great pain, and consequently feels a great
173 deal of empathic pain on their behalf. If the same parent on a different occasion sees the child
174 suffer a minor misfortune resulting in only temporary and mild pain, and feels an empathic pain
175 response that is reduced compared to that which they felt on the first occasion, then one would
176 not infer that the parent had become less empathic (or more formally that their degree of affect
177 sharing had reduced). One would infer that their degree of affect sharing remained the same and
178 that their empathic response was appropriate for the degree of pain attributed to their child in
179 the latter case, even though their empathic response was reduced. On a within-subject level
180 therefore, one cannot assume that a reduced empathic response observed at a certain time
181 point, or after a specific manipulation, is an indicator that affect sharing itself has been reduced
182 unless it can be demonstrated that the empathic response is less than expected given the state

183 identified by the Empathizer in the Target.

184 The same logic holds for between-subjects comparisons. To return to our thought
185 experiment, let us consider the case of two adults who see a child undergo an innocuous accident
186 which would cause only mild and temporary distress in the vast majority of children. However,
187 one of the adults knows that the child suffers from juvenile arthritis and will therefore experience
188 a large degree of pain. We would not infer that the greater degree of empathic pain experienced
189 by this adult is a result of them being more empathic (more formally that they had a greater
190 degree of affect sharing) than the adult who is ignorant of the child's condition. Rather, we would
191 explain their greater empathic response with the fact that they have identified a higher degree
192 of pain in the child.

193 These thought experiments illustrate that in order to correctly measure an individual's
194 degree of affect sharing, one can neither rely solely on the Empathizer's empathic response, nor
195 on the accuracy with which they can identify the Target's affective state, but must instead use
196 the degree of correspondence between the Empathizer's empathic response and the
197 Empathizer's identification of the Target's state. Without measurement of both of these factors,
198 it is impossible to dissociate emotion identification and affect sharing in order to explain variance
199 in the empathic response.

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205 **4 Implications for paradigms used in basic and clinical studies of** 206 **empathy**

207 We have argued that it is necessary to distinguish between emotion identification and
208 affect sharing in order to characterise individual differences in the empathic response, unless
209 empathy is redefined as affect sharing. However, whether one retains the existing definition of
210 empathy but measures differences in emotion identification and affect sharing, or adopts the
211 new definition of empathy, the methodological implications are identical: one must obtain
212 independent measures of emotion identification and affect sharing. This new methodological
213 framework has important implications for the most commonly used measures of empathy, and
214 for the interpretation of manipulations aimed at modulating empathy. Several of these are
215 outlined below, with discussion of how methods or interpretations may need revising in light of
216 the distinction between emotion identification and affect sharing.

217

218 **4.1 The Empathic Accuracy Task (EAT)**

219 The EAT, based on work by William Ickes and others (Ickes, Stinson, Bissonnette, &
220 Garcia, 1990; Levenson & Ruef, 1992) and subsequently used by Zaki and colleagues (Devlin, Zaki,
221 Ong, & Gruber, 2016; Zaki, Bolger, & Ochsner, 2008) is a measure in which a group of
222 interviewees (Targets) describe an emotional experience while providing continuous ratings of
223 how they feel. These videotaped interviews are then used as stimulus material for experimental
224 participants (Empathizers); while watching the videos the participants are asked to provide
225 continuous ratings of the emotional state of the interviewee. Traditionally, the data are analysed

226 by calculating the degree of correlation between the continuous ratings provided by the
227 interviewee and those provided by experimental participants. This degree of congruence is
228 described as a measure of empathic accuracy. However, based on the framework described
229 above, we would suggest that any discrepancy between the ratings provided by the interviewee
230 and the experimental participant might be better characterized as an error in emotion
231 identification. We can see from Figure 1 that Individual D would be described as having perfect
232 empathic accuracy on this measure, even though they lack any empathic response to the state
233 of the other. Accordingly, a valuable addition to this task, and, as will become apparent, to all
234 empathy tasks, would be to require participants to provide two sets of ratings: the first, as used
235 in the existing version of this task, indicating how they think the interviewee feels; and the second
236 indicating how they themselves feel. When these two sets of ratings are obtained, the
237 participant's judgement as to the state of the interviewee and the interviewee's report of their
238 own state can be compared to obtain a measure of the accuracy of emotion identification,
239 whereas the participant's judgement of the interviewee's state and the participant's report of
240 their own state can be compared to derive a measure of affect sharing (as described in Figure 2).
241 Ideally, steps should be taken to avoid these ratings influencing each other. For example, the
242 ratings could be obtained during separate experimental sessions in a counterbalanced order.

243

244 **4.2 'Implicit empathy' paradigms**

245 First utilized by Jackson, Meltzoff, & Decety (2005), these paradigms involve the
246 participant being presented with images of bodies in either painful or non-painful situations. The
247 neural activity elicited by the painful images is compared with that elicited by the non-painful

248 images in order to obtain a neural signature of empathy-related brain activity. This activity can
249 then be compared across individuals or groups. A behavioural variant of this procedure was used
250 by Gu and collaborators (Gu et al., 2010) in which participants were asked to perform an
251 incidental task (e.g. determining whether images were of a left or a right hand) with the same
252 painful and non-painful images of body parts. Reaction times on the incidental task were
253 compared for painful and non-painful images on the assumption that images of others in pain
254 would interfere with performance on the incidental task due to the empathic distress they evoke,
255 and that therefore the degree of interference (in terms of reaction time) is an index of empathy.

256 As noted above, however, with these paradigms it is not clear how much of the variance
257 in the empathic response (whether behavioural or neural) is due to variance in emotion
258 identification, and how much to affect sharing. In the original study by Jackson et al. (2005), there
259 was a strong correlation between the intensity of pain identified in the other and activation in
260 the mid cingulate cortex, an area often, but not always, associated with empathy (see Lamm,
261 Decety, & Singer, 2011 for a meta-analysis). Although pain intensity ratings might be influenced
262 by both emotion identification and the empathic response, it is likely the case that a substantial
263 proportion of the variation in the empathic brain response is due to variation in emotion
264 identification. Therefore, when these paradigms are used to compare the effect of experimental
265 manipulations or group membership, effects on the degree of pain identified in the other should
266 be measured and taken into account in the analysis of any effect on the empathic response - if
267 changes in identified pain fully explain changes in the empathic response then the effect can be
268 attributed to emotion identification, whereas if an effect persists after accounting for variance in
269 emotion identification then one can be more confident in attributing any effect to affect sharing.

270 For example, Decety and collaborators (Cheng et al., 2007; Decety, Yang, & Cheng, 2010) showed
271 that physicians had a decreased neural response when observing pain in others. As in Jackson
272 and collaborators' study, the neural response was correlated with pain intensity ratings, which
273 were lower in the group of physicians. Therefore, it is possible that the difference in the neural
274 response in physicians is solely due to differences in pain identification – indeed, the
275 underestimation of the intensity of patients' pain in physicians is well-documented (see Prkachin,
276 Solomon, & Ross, 2007 for a review). If this is the case, then matching the stimuli presented on
277 the degree of pain identified by each group should lead to typical empathic responses in
278 physicians.

279

280 **4.3 'Shared Network' imaging studies with a fixed stimulus**

281 One of the first neuroimaging studies of empathy was performed by (Singer et al., 2004).
282 This study is of particular interest as participants were only shown one of four coloured arrows.
283 Each arrow signalled that either the participant or their experimental partner would receive a
284 painful or a non-painful electric shock (each arrow signalled one of the four possibilities).
285 Crucially, before the experiment, both the participant and the partner underwent a pain
286 thresholding procedure so that all participants received a shock calibrated to produce a fixed
287 percentage of the maximum pain they could tolerate. Thus, in principle, receipt of the painful
288 shock had the same subjective value for the participant and their partner. Following this
289 procedure, the degree of empathic brain activity elicited by the partner's painful shocks in areas
290 of the brain responding when participants received pain themselves served as a neural index of
291 empathy. Despite only measuring the empathic response, the use of this paradigm is less

292 susceptible to interference from variance in emotion identification as, at least in principle, the
293 degree of pain is fixed for all participants. While a manipulation check could have been used to
294 ensure that there wasn't variance in the extent to which participants judged their partner to have
295 habituated to the shock, or the extent to which their partner may have experienced increasing
296 pain summation with repeated shocks, the use of a clearly defined and unchanging Target pain
297 intensity is of value here. The implication is that any variance in the neural empathic brain
298 response is attributable to affect sharing rather than emotion identification.

299 A variant of this procedure was used in two of our (M.R., G.S. and C.L.) recent studies
300 (Rütgen, Seidel, Riečanský, & Lamm, 2015; Rütgen, Seidel, Silani, et al., 2015). These experiments
301 were designed to investigate the effect of reduced self-pain on the response to the pain of others.
302 The participant's own pain was reduced with use of a placebo analgesia procedure in which the
303 participants were given an inert pill and informed that it would reduce their pain. In common
304 with previous demonstrations of placebo analgesia this manipulation was successful; electric
305 shocks were perceived as less painful than prior to the manipulation. The Singer and colleagues
306 paradigm described above was then administered, with the addition of a photograph of the
307 partner's pained facial expression when they received a shock. Crucially, participants were asked
308 to judge the degree of pain experienced by the partner when the partner received a shock, and
309 also how bad the partner's shock made the participant feel. Although not the focus of either
310 paper, the fact that participants were asked to report their estimate of their partner's pain, and
311 the degree of affective response evoked in themselves, enable the independent effects of the
312 intervention on emotion identification and affect sharing to be established.

313 The results obtained by Rütgen and colleagues show that the placebo analgesia

314 manipulation reduced self-reported empathic responses (i.e., “How unpleasant did it feel when
315 the other person was stimulated?”), but also reduced the intensity of the pain perceived in the
316 partner (i.e. “How painful was this stimulus for the other person?”). Since the decrease in the
317 participant’s empathic response was similar to the reduction in the intensity of the pain perceived
318 in their partner, it is therefore possible that the effect of the placebo analgesia manipulation on
319 the empathic response is solely a product of the reduction in the intensity of the perceived pain
320 (i.e. an effect on emotion identification), and not explained by an effect on affect sharing. This
321 was supported by the results of a mediation analysis on the original behavioural data from the
322 102 participants reported in the Rütgen, Seidel, Silani, et al. (2015) study. The results obtained
323 (Figure 4B) show that the effect of the placebo analgesia manipulation on the empathic response
324 (ratings of how unpleasant it was for the self when the other received pain) was fully mediated
325 by the intensity of the pain attributed to the partner (intensity of other-pain ratings). Indeed, a
326 significant indirect effect ($ab = 0.46$, bootstrap 95% confidence interval: 0.11-0.79) explained 93%
327 of the effect of the placebo manipulation on the empathic response. These data thus suggest
328 that the effect of the placebo analgesia manipulation was on emotion identification and not
329 affect sharing.

330 These data also allow an alternative model to be tested; that there is a feedback effect of
331 the empathic response on emotion identification. Note that emotion identification would still
332 contribute unique variance to the empathic response – the state identified in the Target would
333 determine, in part, the empathic response elicited in the Empathizer, and therefore would
334 constrain the degree of empathic response available to modulate emotion identification. The
335 feedback model can be tested using the data of Rütgen, Seidel, Silani, et al., (2015) by assessing

336 the mediating effect of the empathic response on the relationship between the placebo
337 manipulation and emotion identification (Figure 4C). This analysis showed that the indirect effect
338 in the mediation model did not reach significance (indirect effect $ab = 0.30$; bootstrap 95%
339 confidence interval: $-0.02-0.66$), and that although the empathic response explained 54% of the
340 placebo effect on emotion identification (compared to 93% of the effect explained by the
341 emotion identification mediation model), the placebo manipulation was still a significant
342 predictor of emotion identification after the empathic response was taken into account (path c' ,
343 $p = 0.035$, one-tailed). It should be noted, though, that the two types of ratings were not
344 counterbalanced; other pain estimates were always collected before ratings of the empathic
345 response. These results should therefore be interpreted with caution due to the possible
346 presence of an order effect. While these findings do not therefore necessarily imply that placebo
347 analgesia always exerts its effects on empathy by influencing emotion identification alone, they
348 are used here to illustrate the importance of considering emotion identification and affect
349 sharing as processes that can vary independently.

350 The inclusion of measures of both empathic response and emotion identification is a
351 useful feature of the Rütgen and collaborators studies. Other studies aiming at manipulating
352 empathy did not follow this procedure and therefore cannot distinguish between changes in
353 emotion identification and affect sharing. For example, recent neurostimulation studies
354 (including one from our group (M.-P.C.)) have interpreted changes in intensity ratings of others'
355 pain following transcranial direct current stimulation to the dorsolateral prefrontal cortex (Wang,
356 Wang, Hu, & Li, 2014) or the temporoparietal junction (Coll, Tremblay, & Jackson, 2017) as
357 changes in empathic responses. However, in both of these cases, since empathic responses were

358 not measured, it could be the case that the stimulation only altered the participants' emotion
359 identification.

360 This brief review of empathy paradigms and empathy modulation studies further
361 illustrates that changes in affect sharing should be measured as changes in the relationship
362 between the intensity of the emotion attributed to the Target and the degree of the empathic
363 response to the Target's state (Figure 3). Alternatively, a mediation model may be used in order
364 to determine whether emotion identification mediates the effect of any intervention on the
365 empathic response: If emotion identification fully mediates any effect on the empathic response
366 then it is likely that affect sharing is not affected. The important implication of this empirical
367 framework is that we should no longer talk of modulations of empathy, rather we should
368 distinguish between modulation of emotion identification and affect sharing (or, as mentioned
369 above, redefine empathy as affect sharing). A claim that a manipulation affects affect sharing
370 should be accompanied by a demonstration that any modulation of the empathic response is
371 independent of (or at least not fully explained by) altered emotion identification. This can be
372 achieved by measuring and taking into account emotion identification when testing empathic
373 responses, or by individually calibrating the stimuli used to ensure that all participants attribute
374 the same degree of emotion to the Target. Future studies should also further assess the typical
375 relationship between emotion identification and affect sharing across the population and the
376 factors that can influence this relationship.

377

378 **5 Affect sharing and emotion identification in clinical conditions**

379 Due to its crucial role in social interaction, there has long been an interest in assessing

380 empathy in clinical conditions thought to be characterized by impaired social functioning. In
381 recent years this has led to the frequent use of the paradigms discussed above, and other
382 approaches, to measure empathic responses in clinical populations. While it is beyond the scope
383 of this paper to describe how emotion identification could explain many findings suggesting
384 altered empathy in clinical populations, the distinction between emotion identification and affect
385 sharing has important implications for future clinical research on empathy. For example, there is
386 accumulating evidence that levels of alexithymia, a sub-clinical condition associated with
387 problems in identifying one's own emotions (Nemiah, Freyberger, Sifneos, & Others, 1976), can
388 explain the poor ability to identify the emotion of others which is observed in several psychiatric
389 disorders (Bird & Cook, 2013; Brewer, Cook, Cardi, Treasure, & Bird, 2015; Cook, Brewer, Shah,
390 & Bird, 2013; Heaton et al., 2012; Keysers & Gazzola, 2014; Lamm et al., 2016). Therefore, the
391 investigation of empathic responses within these clinical groups should describe potential
392 differences in empathy in relation to the ability to identify one's own emotional states and the
393 emotional states of others. Adequately characterizing each of these abilities and their interaction
394 will help improve future research and psychological treatments. This is especially important as it
395 is likely that deficits in emotion identification will require different therapeutic interventions than
396 those designed to increase affect sharing, even though both interventions may result in an
397 increased empathic response. With respect to a condition such as psychopathy, for example, we
398 have previously argued that psychopaths may have impaired emotion identification, and this is,
399 in part, why they do not develop typical affect sharing. Investigating emotion identification and
400 affect sharing longitudinally in young children with psychopathic traits would help confirm
401 whether this proposition is correct. In contrast, those with Autism Spectrum Disorder may have

402 intact affect sharing and emotion identification when contextual and social inferences are not
403 necessary (Bird & Viding, 2014; Fan et al., 2013; Hadjickani et al., 2014; Lockwood, Bird, Bridge &
404 Viding, 2013; Tell & Davidson, 2014).

405

406 **6 Further considerations**

407 Although we have argued for the independence of emotion identification and affect
408 sharing, it is clear that this is an oversimplification of the complete empathic process (see Bird &
409 Viding, 2014 for a more comprehensive attempt to identify all the processes involved in
410 generating an empathic response). There are many processes that may impact on the empathic
411 response, and on emotion identification, that are not addressed here (these include action
412 perception, theory of mind, and interoception) and all may make the relationship between
413 emotion identification, affect sharing, and the empathic response difficult to observe in
414 experimental settings if they do not include the means to experimentally or statistically account
415 for variance in these additional processes. It should also be recognized that the empathic
416 response is the result of a dynamic process which unfolds over time, with the possibility of
417 recurrent processing and feedback from later processing stages to earlier processing stages.
418 Rather than negate the necessity of dissociating emotion identification and affect sharing,
419 considerations such as these highlight that the ultimate aim should be to produce a dynamic
420 model of all processes that contribute to the empathic response in order to gain a complete
421 picture of an individual's or group's socio-affective ability, or to understand the impact of an
422 intervention which modulates the empathic response.

423 It should also be noted that we have not addressed the distinction which is sometimes

424 made in the literature between empathy and emotion contagion (e.g. de Vignemont & Singer,
425 2006; de Waal, 1996; see also Hatfield, Cacioppo, & Rapson, 1993). This distinction is typically
426 drawn on the basis of self-other distinction; for example de Waal (1996) defines emotional
427 contagion as *“total identification without discrimination between one’s feelings and those of the*
428 *others (p. 80)”* whereas empathy occurs when *“the other is recognized not just as an extension*
429 *of the self, but as a separate entity (p. 69)”*. Singer & de Vignemont (2006) go further, stating that
430 empathy is distinguished from emotion contagion when the Empathiser realises that their state
431 has been caused by the state of the Target. The distinction between emotion contagion and
432 empathy is clearly important for the phenomenology of the empathic experience; and influences
433 whether the Empathiser feels a state of personal distress due to a lack of self-other distinction
434 between their state and the negative state of the Target, or a state of empathic concern (Nancy
435 Eisenberg & Sulik, 2012). It also likely influences the likelihood and type of behaviour in response
436 to another’s state - personal distress may prompt a withdrawal response from the Target,
437 whereas empathic concern is more likely to prompt prosocial helping behaviour (Batson, Fultz, &
438 Schoenrade, 1987; de Waal, 2008; Eisenberg, Hofer, & Vaughan, 2007). However, this distinction
439 has less relevance for the framework presented above. As previously noted, emotion
440 identification may involve a conscious recognition of the state of the Target or not. If emotion
441 identification is accurate but not conscious, and the affect sharing system is intact, then emotion
442 contagion (as defined by de Waal, 1996) will result. If emotion identification is accurate and
443 conscious, and the affect sharing system is intact, then the Empathiser will be in the same state
444 as the Target (meeting the standard definition of empathy) and will have a conscious
445 representation of the Target’s state. It is an open question as to the factors that determine

446 whether the Empathizer then engages in self-other distinction (Bird & Viding, 2014; de Waal,
447 2008), or realizes that their state has been caused by that of the Target (de Vignemont & Singer,
448 2006).

449 Finally, the main focus of this text has been on empathy in humans and we have not
450 addressed the implications of this new framework for non-human animal studies, which can
451 provide an important contribution to the understanding of the cognitive and affective processes
452 underlying empathy (de Waal & Preston, 2017; Panksepp & Panksepp, 2013). Since it has been
453 previously argued that empathy is supported by similar processes in nonhuman mammals
454 (Meyza, Bartal, Monfils, Panksepp, & Knapska, 2017; Panksepp & Lahvis, 2011), it would be
455 interesting for future studies to also attempt to measure and dissociate processes akin to
456 emotion identification and affect sharing in non-human animals.

457 **7 Conclusion**

458 The fact that emotion identification and affect sharing are often confounded in
459 experimental paradigms, or used as interchangeable terms, or described as 'empathy' reflects
460 both the paucity of information processing models of socio-cognitive processes and the lack of a
461 common lexicon in the social cognition literature (Happé et al., 2017). These processes may be
462 interrelated, but they need to be considered independently to understand the mechanisms
463 underlying individual differences in empathic responses, and to identify the locus of any
464 modulation of empathic response in clinical populations or due to psychological or
465 pharmacological interventions. Adequately characterizing each of these mechanisms and their
466 interaction will help improve future cognitive neuroscience research and psychological
467 treatments. Furthermore, and equally important, consideration of the differential impact of

468 impaired emotion recognition and affect sharing leads us to offer a novel empirical framework
469 to measure empathy, and to describe variance in empathic responses. Whether this aim would
470 be better served by redefining empathy as affect sharing - as the degree to which the
471 Empathizer's own state matches that identified in the Target - is an open question. Nevertheless,
472 the resolution of this issue does not negate the requirement to measure emotion identification
473 and affect sharing independently in any study of empathy, and so we recommend the use of the
474 measurement framework described here.

475

476

477 **Conflict of interest**

478 The authors declare no competing financial interests.

479

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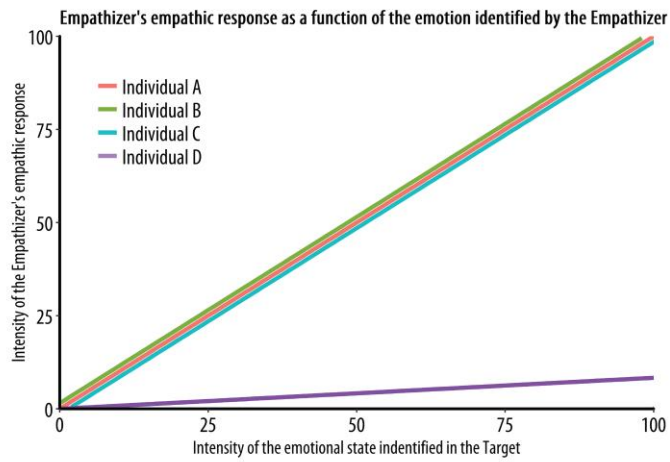
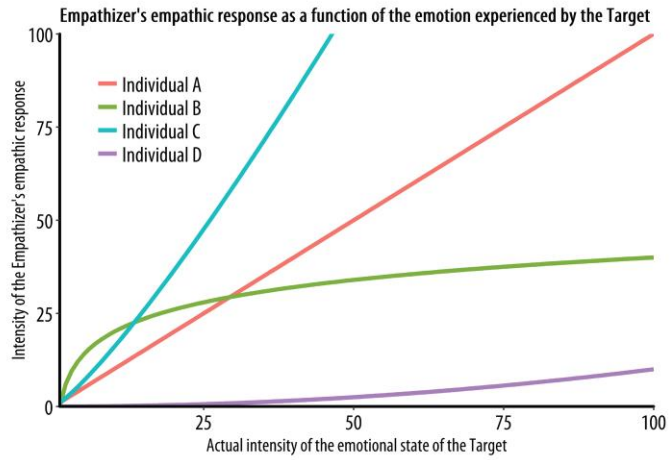
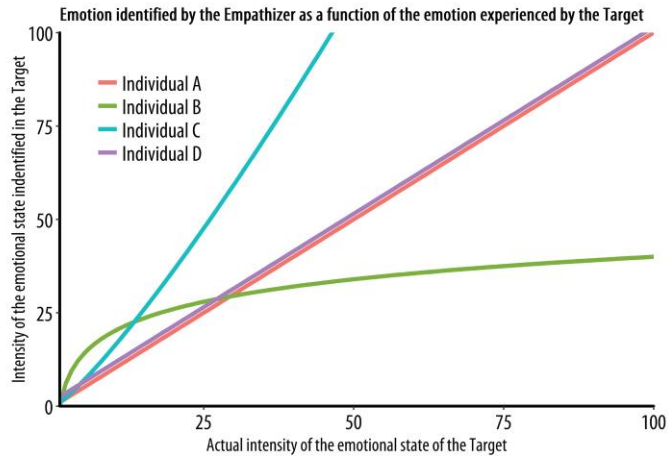
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Figures

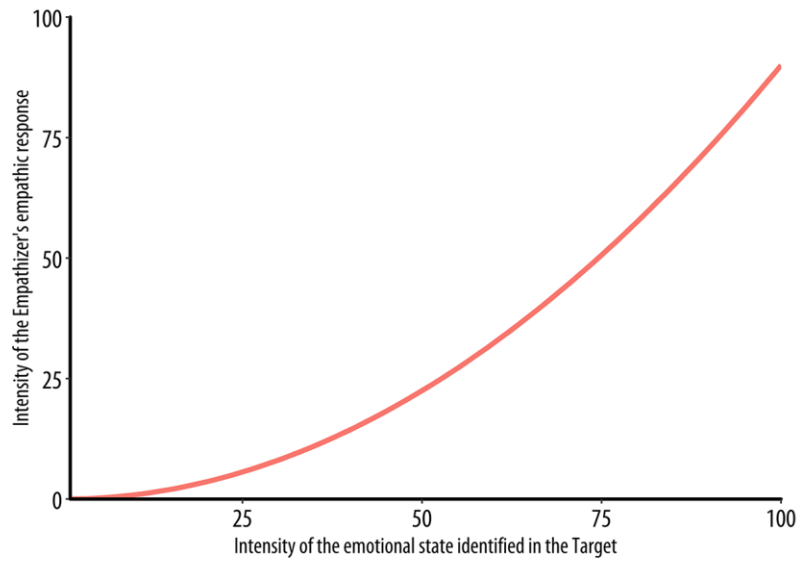


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634 **Figure 1.** Theoretical graphs illustrating the relationship between the emotion
635 experienced by the Target and the emotion identified by the Empathizer (top panel), the
636 relationship between the Empathizer's empathic response and the emotion experienced by the
637 Target (middle panel) and the relationship between the same empathic response and the degree
638 of emotion identified in the Target by the Empathizer (bottom panel) for four different
639 individuals. Individual A shows perfectly accurate emotion identification (top panel) and a degree
640 of affect sharing which could be described using the equation for a straight line in the following
641 manner [Emotion Elicited = 1 x Emotion Identified + 0], producing an empathic response that is
642 perfectly concordant with the emotion they identify in the Target (bottom panel). They also meet
643 the standard definition of empathy as they are in the same state as the Target (middle panel).
644 Individuals B and C have less accurate emotion identification ability (top panel), tending to
645 overestimate or underestimate the intensity of the Target's emotional state, respectively.
646 However, they both show an empathic response which is concordant with the emotion they
647 identify in the Target (bottom panel), and so would be judged to have the same degree of affect
648 sharing, described using the same equation, as Individual A. Note that Individuals B and C would
649 not meet the standard definition of empathy as their state does not match that of the Target
650 (middle panel). Individual D is excellent at identifying the state of the Target (top panel).
651 However, this individual's degree of affect sharing is significantly less than that of Individuals A,
652 B and C – the slope of the line describing their empathic response in response in response to
653 emotion identified in the Target is significantly less than that of the other individuals Emotion
654 Elicited = 0.1 x Emotion Identified + 0] (bottom panel). This individual would also not meet the
655 standard definition of empathy as their state does not match that of the Target (middle panel),
656 but the source of their lack of empathy is very different to that of Individuals B and C.

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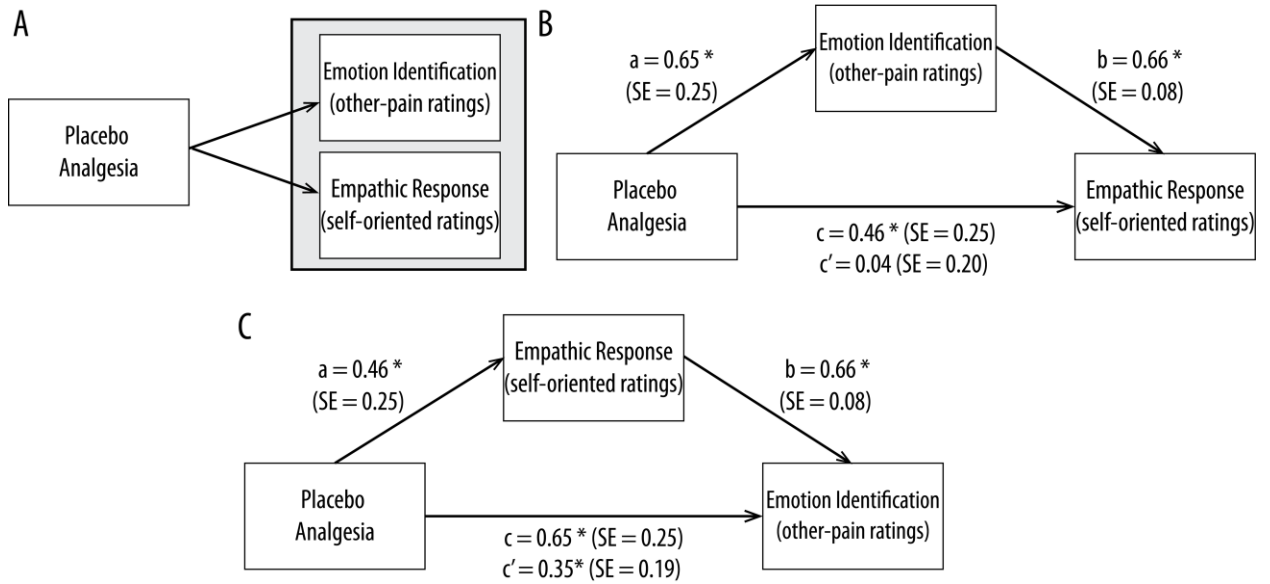
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Figure 2. Graphs illustrating the relationship between the intensity of the empathic response elicited in the Empathizer as a function of the intensity of the emotional state identified in the Target. We characterise this relationship as affect sharing, and three measures may be of interest: 1) the intensity of Target emotion at which the Empathizer’s empathic response is non-zero, 2) the slope of the function (indicating the degree to which changes in the Target’s state prompt changes in the Empathizer’s state), and 3) the shape of the function (of particular interest would be an exponential function which may indicate a dynamic interaction between empathy and emotion attribution at higher intensities of Target emotion).



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Figure 3. Hypothetical illustrations of the relationship between emotion identification, affect sharing and the empathic response. A manipulation leading to a decrease in emotion identification with a corresponding decrease in the empathic response is a sign of an absence of a change in affect sharing (A and B). The hypothetical manipulation illustrated in C and D illustrates a decrease in emotion identification, together with a greater decrease in empathic response, indicating a decrease in emotion identification and affect sharing.



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Figure 4. Three possible models of the relationships between the placebo analgesia manipulation, empathic response and emotion identification as reported in Rütgen et al. (2015). In A, both empathic response and emotion identification are independently influenced by the placebo analgesia manipulation. A mediation analysis of the Rütgen et al. data did not support this model, instead, as presented in B, the data demonstrate that the change in empathic response was fully mediated by changes in emotion identification. C shows that the empathic response also explains some, but not all, of the variance of the experimental effect on emotion identification. * $p < 0.05$, one-tailed.