



Is the Questionnaire of Cognitive and Affective Empathy measuring two or five dimensions? Evidence in a French sample



Nils Myszkowski^{a,b,*}, Eric Brunet-Gouet^{c,d}, Paul Roux^{c,d,e}, Léonore Robieux^{b,f}, Antoine Malézieux^g, Emilie Boujut^f, Franck Zenasni^b

^a Department of Psychology, Pace University, New York, NY, United States

^b Laboratoire Adaptations Travail-Individu, Université Paris Descartes, Université Sorbonne Paris Cité, Boulogne-Billancourt, France

^c Service Universitaire de Psychiatrie d'Adultes, Centre Hospitalier de Versailles, Le Chesnay, France

^d Laboratoire EA4047 HandiResp, Université de Versailles Saint-Quentin-En-Yvelines, Montigny-le Bretonneux, France

^e Schizophrenia Center of Expertise, Fondation FondaMental, Créteil, France

^f Laboratoire de Psychopathologie et Processus de Santé, Université Paris Descartes, Université Sorbonne Paris Cité, Boulogne-Billancourt, France

^g Bureau d'Economie Théorique et Appliquée, Université de Lorraine, France

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ABSTRACT

Although many instruments measure empathy, most of them focus on specific facets (e.g., Spreng et al., 2009) or specific contexts (e.g. Wang et al., 2003) of empathy. For this reason, the Questionnaire of Cognitive and Affective Empathy (QCAE; Reniers et al., 2011) was recently built to grasp the general construct of empathy through its Affective-Cognitive duality, although not providing clear-cut results about the bidimensionality of the scale. In this study, Confirmatory Factor Analyses were conducted on the responses of 418 adults on the French QCAE (backtranslated for this study). A total of 8 models were tested – including the models of the original investigation. The 5-correlated factors model had the best fit, and the pattern of correlations between the factors did not support the Cognitive-Affective distinction. The QCAE is discussed as showing signs of psychometrical robustness, but also as a tool that is more 5-dimensional than bidimensional.

1. Introduction

Although empathy has many definitions, it is generally defined as the ability – or the set of abilities – involved in the understanding and to experiencing of other people's emotional experience (Reniers et al., 2011). While high empathy is often linked with a range of prosocial behaviors (Eisenberg and Miller, 1987), low empathy is frequently associated with psychiatric disorders, notably psychopathic (Blair, 2005) and autistic (Baron-Cohen and Wheelwright, 2004) disorders. Because of the large array of behaviors associated with empathy – leadership (Kellett et al., 2006), quality of patient-practitioner interactions (Rakel et al., 2011), clinical competence (Hojat et al., 2004), etc. – measuring empathy is of direct interest to researchers and practitioners of many fields (health psychology, clinical psychology, social psychology, occupational psychology, etc).

Because of its multidimensional nature (Blair, 2005; Reniers et al., 2011), there are several instruments to measure empathy. However, most of the tools that are currently used evaluate either a global component of empathy, or specific components of this construct. The first scale that was developed was the Hogan Empathy Scale (HES; Hogan,

1969), which aimed at measuring social self-confidence, even-temperedness, sensitivity, and nonconformity. However, the structural validity of the scale was not clearly established and some authors (Spreng et al., 2009) suggested that it actually measured social skills, more than empathy per se. The Interpersonal Reactivity Index (IRI; Davis, 1983) assesses four components of empathy: Perspective taking, fantasy, empathic concern and personal distress. However, it was criticized, as some of the subscales are actually more related to imagination than on empathic skills (Baron-Cohen and Wheelwright, 2004). More questionnaires of empathy exist, but these tools either measure the expression of empathy in specific contexts – such as clinical empathy (Hojat et al., 2004) or ethnocultural empathy (Wang et al., 2003) – or specific subfactors of empathy – such as the Toronto Empathy Questionnaire (TEQ; Spreng et al., 2009), which measures empathy considered as the outcome of a primarily emotional process.

1.1. Development of the QCAE

Facing such proliferation of tools, Reniers et al. (2011) proposed to develop a consensual questionnaire based on previous scientific results

* Corresponding author at: Department of Psychology, Pace University, 41 Park Row, New York, NY, United States.
E-mail address: nmyszkowski@pace.edu (N. Myszkowski).

from behavioral and neurocognitive studies. They especially considered the distinction between Cognitive and Affective Empathy, previously suggested by Blair (2005). Cognitive Empathy refers to the theory of mind and the ability of individuals to represent the mental state of others; Affective Empathy involves both emotional and motor response to the emotional states and feelings of others (Blair, 2005). Cognitive Empathy supposes that visual, auditory, or situational information is processed in order to represent another person's cognitive and emotional state, while Affective Empathy involves the automatic recognition of others' emotions, based on their emotional expressions – facial expressions, body gestures, and voice prosody (Reniers et al., 2011).

Based on this theoretical distinction, a two-factor model of empathy was investigated on previously developed questionnaires by Reniers et al. (2011), leading to the development of the Questionnaire of Cognitive and Affective Empathy (QCAE). More specifically, the QCAE was developed with items derived from validated previous questionnaires, notably the Empathy Quotient (Baron-Cohen and Wheelwright, 2004), the HES (Hogan, 1969), the Empathy subscale of the Impulsiveness-Venturesomeness-Empathy Inventory (Eysenck and Eysenck, 1978), and the IRI (Davis, 1983). After expert raters classified the items as either Cognitive or Affective Empathy items, a first version of the QCAE – including 65 items – was then built using a 4-point Likert scale response format (from strongly disagree to strongly agree).

A study was conducted to test the factor structure of this first scale. After conducting a Principal Components Analysis (PCA), the authors conserved 5 factors, based on their contribution to the item variance: Perspective taking, Online Simulation, Emotion Contagion, Peripheral Responsivity and Proximal Responsivity. Perspective Taking corresponds to the ability of putting oneself in another person's position (e.g. "I am good at predicting how someone will feel"); Online Simulation corresponds to the determination to understand another person's feeling (e.g. "I sometimes try to understand my friends better by imagining how things look from their perspective"); Emotion Contagion corresponds to the automatic echoing of other people's feelings (e.g. "People I am with have a strong influence on my mood"); Peripheral Responsivity corresponds to the affective involvement when observing other people's feelings in a detached context (e.g. "I often get deeply involved with the feelings of a character in a film, play, or novel."); Proximal Responsivity corresponds to the affective involvement when observing other people's feelings in a close social context (e.g. "I often get emotionally involved with my friends' problems.>").

Based on the identification of these 5 factors, the authors developed a final version of the QCAE. Using parceling, Confirmatory Factor Analyses were conducted on a second sample, supporting structures with 5 factors, with or without Cognitive Empathy and Affective Empathy as correlated second order factors. Perspective Taking and Online Simulation were included as subfactors of Cognitive Empathy; Emotion Contagion, Peripheral Responsivity and Proximal Responsivity were included as subfactors of Affective Empathy.

1.2. Structure uncertainties

The QCAE distinguishes itself from other empathy measures by its dimensionality (Reniers et al., 2011), with, theoretically at least, a distinction between two higher order factors of Cognitive and Affective Empathy, and a total of five subcomponents. However, it should be noted that the results of the original study did not rule in favor of a structure with 2 s order factors, for three reasons: (1) A 5-factor – not a 2-factor – structure naturally emerged from the PCA in the first sample; (2) in the second sample, the fit of the model *without* second order factors was actually better than the fit of the model with second order factors; (3) even though the fit indices of the theoretical 5 factors model with second order factors was still considered acceptable, the authors indicated that, in order to solve a negative variance problem, an inequality constraint was added to the model: In spite of constrained estimation being a frequent strategy in such cases, we should note these

issues have various causes, including model misspecification (Chen et al., 2001). These three results clearly question the Cognitive-Affective second order factors, and encourage replications and further investigations of the dimensionality of the QCAE.

1.3. Objectives

As empirical research did not previously point to critical cultural specificities in the measure, structure or expression of empathy in French-speaking cultures (Berthoz et al., 2008; Lepage et al., 2009), we decided to investigate – for the first time in a French-speaking sample – the structure of the QCAE.

The aim of this study was to build a French translation and adaptation of the QCAE, and to further investigate its factor structure, in order to verify the structure of the questionnaire that was originally found by the authors, thus advancing the understanding of the structure of Cognitive and Affective Empathy. We investigated the factor structure of the French QCAE using procedures that replicate those used in the second study of the original article, hypothesizing that similar results will be observed. We also went further in the structural analysis of the French QCAE by testing 6 additional relevant models and by comparing their fit with the fit of the models that were originally investigated.

2. Method

2.1. Participants

Participants were recruited both online through social media advertising and through advertisement in classes of Universities in France. Only proficient French speakers were invited to participate. After being presented with an informed consent form, all participants were administered the QCAE online. The participants were not offered any course credit or compensation for responding. A total of 418 French-speaking adults (275 females and 143 males, $M_{age} = 26.1$, $SD_{age} = 8.2$) participated in the study, with ages ranging between 18 and 60. Most participants ($n = 324$) identified themselves as students, among which 186 and 56 of them identified themselves respectively as Medicine and as Psychology students.

2.2. Instrument

The French QCAE is a 31-item questionnaire intended to measure 2 facets and 5 subfacets of empathy. To maintain semantic and conceptual equivalence, the French translation of the QCAE was achieved through a backward translation procedure. More specifically, a first bilingual psychologist translated the QCAE items from English into French, and then, these translated items were back-translated into English by a second bilingual psychologist. They then resolved the disparities and settled on a final translated version.

Satisfactory Cronbach's α coefficients were observed – especially considering the small number of items for Emotion Contagion, Peripheral Responsivity and Proximal Responsivity – and similar to the original version: 0.89 (95% CI [0.88,0.91]) for Perspective Taking (0.85 in the original article), 0.84 (95% CI [0.81,0.86]) for Online Simulation (0.83 in the original article), 0.74 (95% CI [0.70,0.78]) for Emotion Contagion (0.72 in the original article), 0.62 (95% CI [0.57,0.68]) for Peripheral Responsivity (0.65 in the original article), and 0.71 (95% CI [0.67,0.76]) for Proximal Responsivity (0.70 in the original article). We should however note that the assumption of tau-equivalence, made by Cronbach's α , which we tested using Zhang and Yuan's (2016) 'coefficientalpha' package and procedure, revealed significant (all $p < 0.05$) violations of tau-equivalence for all subscales.

McDonald's ω_h (Dunn et al., 2014; McDonald, 2000) is an alternative to Cronbach's α that is more robust to the violation of tau-equivalence (Zhang and Yuan, 2016). It was consequently also used: All

subscales were found to have satisfactory reliability, as investigated through ω_h – computed with the R package ‘psych’ (Revelle, 2016) – with values of 0.77 for Perspective Taking, 0.72 for Online Simulation, 0.72 for Emotion Contagion, 0.66 for Peripheral Responsivity and 0.63 for Proximal Responsivity.

Expectedly, we noted that the Cronbach's α of Peripheral Responsivity was lowered from 0.73 to 0.62 (and ω_h from 0.74 to 0.66) by item 17: It is not surprising because it was actually found to have a small loading (0.44) in the original version. We however kept it in the further factorial analyses, in order to maintain equivalence between the models tested on the original version and on the present French version.

2.3. Analyses

We investigated the structural validity of the French QCAE by conducting Confirmatory Factor Analyses (CFA), using the R-package ‘lavaan’ (Rosseel et al., 2011).

2.3.1. Tested models

In this research, our objective was to further question the dimensionality suggested by the original article (Reniers et al., 2011), and the suggested distinction between Affective and Cognitive Empathy. This original study used CFA, using parceling of pairs and triplets of items. These items were previously identified – in an EFA on an independent sample – as being conceptually similar. To replicate these analyses and compare the dimensionality of the original QCAE with that of the French QCAE, we investigated the factor structure of the QCAE using the exact same parcels and models than in the original article.

Similar to many investigations of structures with (theoretical) second order factors (e.g., Myszowski et al., 2014), we tested a model with 5 correlated factors – named Model A, and identified as the best model in the original version – as well as a model with 5 factors and 2-second order factors (Cognitive and Affective Empathy), Model B. In addition to testing the models tested on the original version, we tested alternate models that reflected different structures that could be justified theoretically: A model with 5 factors and 1 second order factor (general empathy) – Model C – a model with 5 independent factors – Model D – a model with 5 factors and 2 orthogonal second order factors – Model E – a model with 1 factor – Model F – a model with 2 orthogonal – Model G – and a model with 2 correlated factors – Model H. For 3 of the tested models (B, C and E), one (for B) to two (for C and E) negative residual variances were observed: As in the original article, we added inequality constraints to the model where necessary (Chen et al., 2001). However, negative residual variances were later discussed as a sign of potential model misspecification.

2.3.2. Fit indices

We reported various fit indices for each CFA. The cut-off values for acceptable model fit used in this study were: above 0.93 for the Comparative Fit Index (Byrne, 1994), under 0.08 for the Standardized Root Mean Square Residual (Hu and Bentler, 1999), under 0.08 for the Root Mean Square Error of Approximation (Browne and Cudeck, 1992) and under 5 for the χ^2/df ratio (Schumacker and Lomax, 2010). Modification indices were inspected for all models, but they did not point to differences in model specification that would improve substantially the fit.

3. Results

3.1. Factor structure

The examination of the various indices indicates that, as hypothesized, models D, E, F, G and H poorly fitted the data. Only models A, B and C add an acceptable fit (reported in Table 1). However, among these three models, only model A had no negative residual variance

problem. Additionally, model A had the best fit to the data, based on all the fit indices examined.

As model A had the best fit, and no Heywood case, we chose to interpret its estimates, which are reported on the path diagram presented in Fig. 1 (all the loadings and correlations were significant at $p < 0.001$). The pattern of correlations between the five factors was not compatible with a clear-cut two higher order factor structure, with convergent validity correlations within Affective and Cognitive facets not appearing stronger than between Affective and Cognitive facets. Notably, Proximal Responsivity (which is theoretically part of Affective Empathy) was strongly correlated with both Online Simulation ($\beta = 0.79$, $p < 0.001$) and Perspective Taking ($\beta = 0.66$, $p < 0.001$), two Cognitive Empathy facets.

3.2. Gender differences

As gender differences are frequently reported in empathy measures (Reniers et al., 2011) – females typically scoring higher than males – we tested the QCAE's model invariance, using the model with the overall best fit, Model A. As expected, the results supported weak invariance (equal factor loadings; $\Delta\chi^2 = 368.94$, $\Delta df = 10$, $p = 0.30$, $\Delta CFI = 0.001$, $\Delta RMSEA = 0.002$, $\Delta SRMR = 0.003$). Further, the results also supported strong invariance (equal factor loadings and intercepts; $\Delta\chi^2 = 17.47$, $\Delta df = 10$, $p = 0.06$, $\Delta CFI = 0.002$, $\Delta RMSEA = 0.001$, $\Delta SRMR = 0.002$). However, as expected, the results did not support scalar invariance (equal factor loadings, intercepts and means; $\Delta\chi^2 = 428.69$, $\Delta df = 5$, $p < 0.001$, $\Delta CFI = 0.012$, $\Delta RMSEA = 0.005$, $\Delta SRMR = 0.010$). Consequently, we did not compute mean gender differences, as the observation of mean gender differences would be biased by the lack of scalar invariance.

4. Discussion

Through this study, we aimed at resolving uncertainties regarding the factor structure of the QCAE. As its name indicates, the QCAE aims at measuring two main aspects of empathy: Cognitive and Affective empathy. However, while the questionnaire seems to have other good psychometrical qualities (Reniers et al., 2011), the original investigation of the empirical factor structure of the questionnaire did not provide a clear-cut result: Is the structure comprised of 5 correlated dimensions, or is it, like its name suggests, composed of two higher-order factors of cognitive and affective empathy?

Following a procedure that was similar the original article and using a French translation of the questionnaire, we found very similar results and issues, notably encountering the same negative variance problem for the two higher order factors model. We went further in the analysis of the factor structure of the QCAE, using a more extensive approach, both in terms of the scope of the models tested and in terms of estimates examination. What we found was that 1) a 5 correlated factors model fitted the data better than a two correlated higher order model, and that 2) the pattern of correlations between these 5 latent dimensions does not support the existence of two higher order factors. In particular, the pattern of correlations between facets, shown in Fig. 1, suggests problems of both divergent validity and convergent validity. For example, Proximal Responsivity – a facet theoretically representing Affective Empathy – was strongly correlated with both facets of Cognitive Empathy. Oppositely, the correlation within Affective Empathy between Emotion Contagion and Peripheral Responsivity was only moderate. These issues directly question the Cognitive-Affective Empathy distinction in the QCAE.

The lack of scalar gender invariance of the measure did not allow to properly compare mean gender differences on the QCAE scores. It is however generally expected that a female advantage is observed in empathy measures (Reniers et al., 2011). Indeed, gender differences in empathy and in disorders related with lack of empathy – such as psychopathy – are commonly found, and different explanations have been

Table 1
CFA Fit indices of the tested models.

Model Letter	Model	χ^2	df	χ^2/df	CFI	SRMR	RMSEA	AIC
A	5 correlated factors (best model in original version)	277.33	80	3.46	0.938	0.058	0.076	9706.0
B	5 factors with 2 correlated second order factors (with 1 inequality constraint)	305.24	84	3.63	0.930	0.068	0.079	9726.0
C	5 factors with 1 s order factor (with 1 inequality constraint)	341.80	85	4.02	0.919	0.074	0.085	9760.5
D	5 orthogonal factors	920.99	90	10.23	0.738	0.283	0.149	10329.7
E	5 factors with 2 orthogonal second order factors (with 1 inequality constraint)	448.90	85	5.28	0.885	0.184	0.101	9897.6
F	1 factor	997.96	90	11.09	0.713	0.107	0.155	10436.7
G	2 orthogonal factors	822.21	90	9.14	0.769	0.204	0.140	10230.9
H	2 correlated factors	721.39	89	8.11	0.800	0.106	0.130	10132.1

Note. CFI – Comparative Fit Index; SRMR – Standardized Root Mean Square Residual; RMSEA – Root Mean Square Error of Approximation; AIC – Akaike Information Criterion.

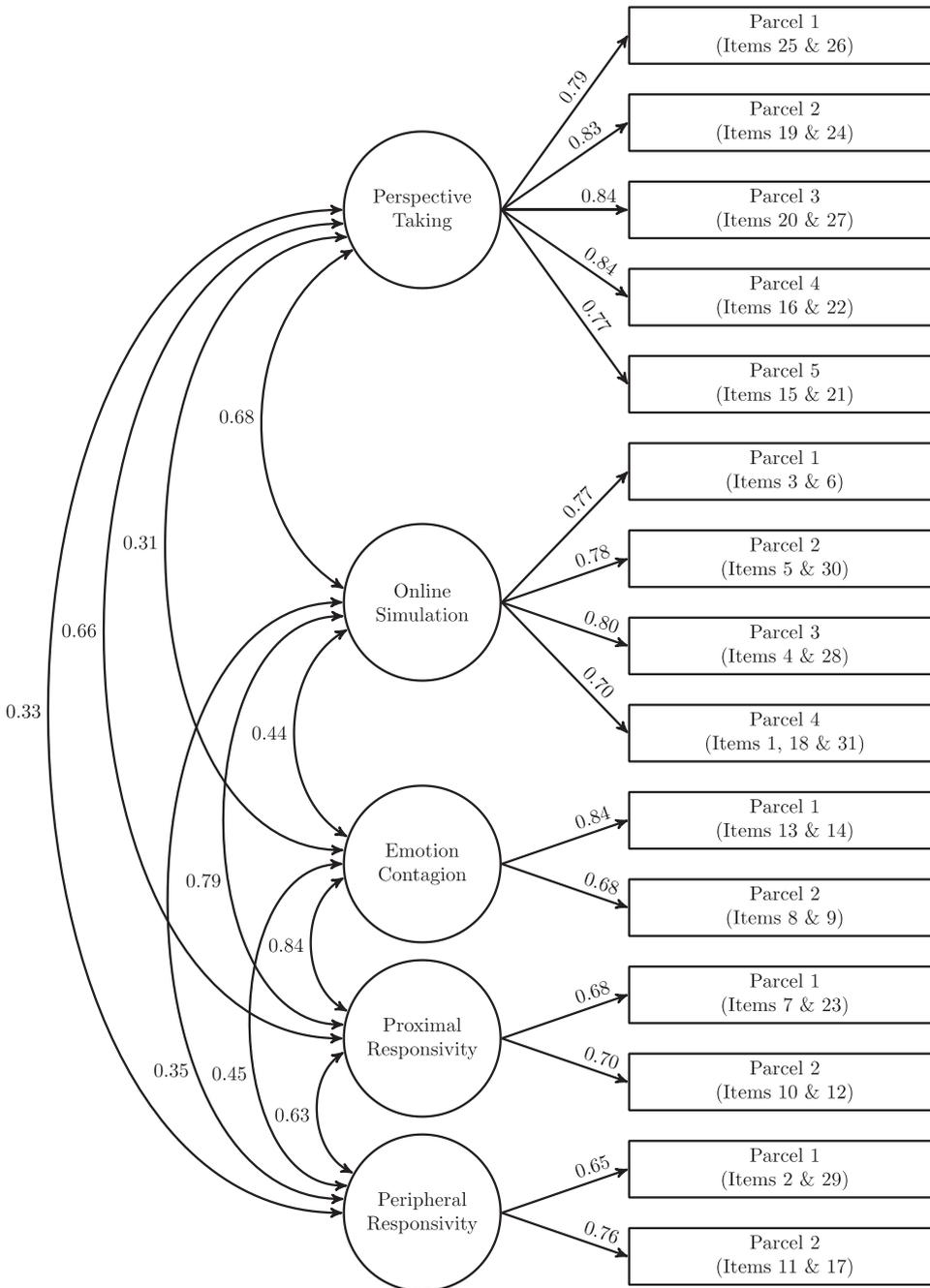


Fig. 1. Model A (best fit) with standardized estimates (all significant at $p < 0.001$).

advanced. Recent research (Christov-Moore et al., 2014) has suggested, notably by focusing on female advantage in emotion management, recognition and prosocial behavior in infancy (Alexander and Wilcox,

2012), childhood (Chaplin and Aldao, 2013), that gender differences in empathy may have a phylogenetic and ontogenetic biological basis, ruling out social desirability and cultural influence as the only

explanations of these differences. Further research on gender differences in empathy may help further understand if the affective-cognitive distinction is gender-related. Additionally, gender is a complex construct, and, as recently suggested (Christov-Moore et al., 2014), variables such as gender roles, sexual preferences and hormone reactivity should be accounted for to better understand individual differences in empathy.

Consequently, we believe that, in spite of the QCAE seeming a robust inventory of 5 correlated facets of empathy – and our results, both in terms of internal consistency, reliability, factor structure and gender invariance are in line with the original article and support this robustness – it does not appear to be the measure of a two-sided construct. In fact, our results point to a 5-factor structure. Nevertheless, parceling is debated practice in Structural Equation Modeling (e.g., Little et al., 2002; Meade and Kroustalis, 2006; Rhemtulla, 2016), and, consequently, we suggest that further studies investigate the QCAE (French or not) using item-level CFA – using ordinal CFA would be recommended, since the items are 4-point Likert scales. Such would require a larger ratio of sample size to variables than used in this study, but could point to further useful revisions of the items of the QCAE. Regarding these further item-level investigations, we can anticipate that they will further encourage eliminating item 17, which was here found to lower the reliability of Proximal Responsivity.

Also, further investigations of the French (and Original) QCAE should be pursued, on a variety of samples – for example, among managers, salespeople, or practitioners – in order for the questionnaire to progressively fully reveal its predictive potential. For example, both trust in and satisfaction with salesperson have been found to be associated with salesperson empathy (Aggarwal et al., 2005); Future research that accounts for the multidimensionality of empathy through the QCAE may advance the understanding of these effects. Likewise, empathy has been identified as a predictor of leadership emergence (Kellett et al., 2002, 2006): Future research in the domain could benefit from a multidimensional operationalization of empathy. Moreover, this study is based on a convenience sample, which may not well represent the French (or French-speaking) general population: This calls for further research with improved sampling methods.

Future research should also investigate other psychometrical qualities of the French QCAE, notably test-retest reliability and criterion validity – especially investigating the relations between the QCAE and a number of empathy related traits and behaviors (anger, impulsivity, aggression, psychopathy, Machiavellianism, etc.). Additionally, as social desirability was found to be associated with empathy (Preti et al., 2011), future research should investigate the social desirability bias in the French QCAE. Further, the structure of the French QCAE, here studied in a non-clinical sample, should also be investigated in a clinical sample in order to further assess psychiatric validity (e.g., Vizin et al., 2016).

Nonetheless, because of the psychometrical qualities so far investigated, we recommend the use of the French QCAE, but we recommend that scores are computed and interpreted for each facet, rather than using a Cognitive Empathy and an Affective Empathy score, which are here not supported. Because of the similar results found in the original version, we think that this recommendation could also hold for the English version.

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