"What influences perspective taking ? A dynamic and multidimensional approach"

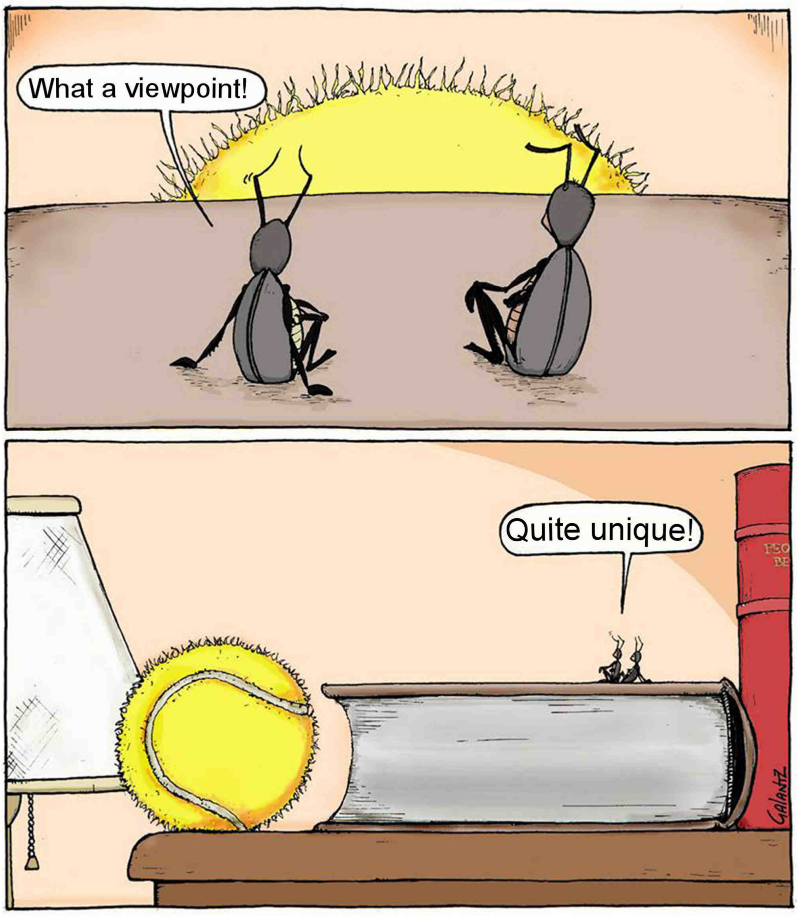
Bukowski, Henryk

Abstract

Perspective-taking (PT) performance is widely considered and assessed as a static and one-dimensional ability. This thesis provides evidence across 4 studies that PT performance fluctuates and is underpinned by two dimensions: (1) the ability to handle conflicts between our egocentric perspective and another person's perspective and (2) the relative priority given to the processing of the egocentric perspective over another person's perspective. We have highlighted the effects of task instructions, emotions, and motivation on PT performance. We also found that each of the two dimensions underlying PT can be specifically affected or associated with factors such as guilt, shame, narcissism, and self-reported PT habits. Finally, we found that individuals strongly vary independently on both dimensions so that some people are more or less efficient at perspectives conflict handling and others are altercentric (i.e. prioritizing the other person's perspective) or egocentric perspecti...

Document type : *Thèse (Dissertation)*

What influences perspective taking?
A dynamic and multidimensional approach



Dessin de Pequeñas bestias par Galantz.

What influences perspective taking?
A dynamic and multidimensional approach

Henryk Bukowski

Thèse présentée en vue de l'obtention du grade de Docteur en sciences psychologiques et de l'éducation

Promotrice

Dana Samson (UCL)

Comité d'encadrement

Bruno Rossion (UCL)
Nicolas Vermeulen (UCL)

Collection de thèses de l'Université catholique de Louvain, 2014

Président

Guy Lories (UCL)

Comité d’accompagnement et jury

Marcel Brass (UGent)
Valérie Goffaux (UCL)
Bruno Rossion (UCL)
Nicolas Vermeulen (UCL)

Tables of contents

Résumé

Nos performances de prise de perspective (PdP) sont largement considérées et mesurées comme une capacité statique et unidimensionnelle. Cette thèse a pour objectif de démontrer que nos performances de PdP fluctuent et sont sous-tendues par deux dimensions : (1) notre capacité à gérer les conflits entre notre perspective égocentrique et celle d'une autre personne et (2) la priorité relative donnée au traitement de notre perspective égocentrique par rapport à celle d'une autre personne. Nous avons mis en évidence l'influence des instructions, des émotions, et de la motivation sur nos performances de PdP. Nous avons également montré que chacune des dimensions peut être spécifiquement influencée ou associée avec des facteurs tels que la culpabilité, la honte, le narcissisme, et les habitudes auto-rapportées de PdP. Enfin, nous avons montré que les individus diffèrent fortement les uns des autres sur les deux dimensions de telle sorte que certaines personnes sont plus ou moins aptes à gérer les conflits de perspectives et d'autres sont particulièrement altercentriques (.i.e. qui traitent en priorité le point de vue de l'autre) ou égocentriques. Globalement, au travers de notre étude de ce qui influence nos performances de PdP, nous avons démontré la pertinence théorique et l'intérêt d'étudier la PdP comme une capacité dynamique et multidimensionnelle.

Abstract

Perspective-taking (PT) performance is widely considered and assessed as a static and one-dimensional ability. This thesis provides evidence across 4 studies that PT performance fluctuates and is underpinned by two dimensions: (1) the ability to handle conflicts between our egocentric perspective and another person's perspective and (2) the relative priority given to the processing of the egocentric perspective over another person's perspective. We have highlighted the effects of task instructions, emotions, and motivation on PT performance. We also found that each of the two dimensions underlying PT can be specifically affected or associated with factors such as guilt, shame, narcissism, and self-reported PT habits. Finally, we found that individuals strongly vary independently on both dimensions so that some people are more or less efficient at perspectives conflict handling and others are altercentric (i.e. prioritizing the other person's perspective) or egocentric perspective-takers. Overall, while investigating what influences PT performance, we demonstrated the theoretical relevance and usefulness of studying PT as a dynamic and multidimensional ability.

Remerciements

Quel parcours pour en arriver à ce stade de ma carrière de chercheur ! Beaucoup de projets et d'embûches, mais surtout beaucoup de rencontres ! Vous êtes tant de personnes à m'avoir directement ou indirectement aidé à tracer mon chemin que des remerciements méthodiques s'imposent pour concilier exhaustivité et concision. Je souhaite cependant remercier spécifiquement Dana Samson. La richesse de ses réflexions, sa patience, sa gentillesse, et son grand sens de la pédagogie m'ont énormément aidé à réaliser cette thèse et à me réaliser en tant que chercheur.

Légende : Ambiance de Travail (AT), Assistance Logistique et Administrative (ALA), Assistance Statistique (AS), Conseils Professionnels (CP), Inspiration Professionnelle et/ou Pédagogique (IPP), Soutien Moral (SM), Soutien Professionnel (SP), Relecture (R).

Adélaïde de Heering (AT,CP)
Adriano Booremanse (AT++)
Agnes Jasinska (AT)
Agnesa Pillon (AT,AS,CP)
Alexandre Heeren (AT++,CP+)
Alexandre Zénon (CP+)
Alexy Assaf Beck (AT)
Alice De Visscher (AT++)
Anand Ramamoorthy (AT++)
André Mouraux (AT,SP)
Andrew Surtees (AT,CP,SP)
Antonio Damasio (IPP++,SP)
Aude Poncin (AT)
Aurélie Biervoye (AT)
Benvenuto Jacob (ALA++)
Bernand Hanseeuw (AT,AS)
Brigitte Champagne (ALA)
Bruno Rossion (AT,CP,SP++,IPP)
Caroline Ego (AT)
Caroline Michel (AT++)
Clément Letesson (AT)
Corentin Jacques (AT)
Dana Samson (AT,AS,CP,SM,SP++,IPP++,R)
Daniela Ebner (AT+)
Dave Herman (AT+)
Delphine Grynberg (SP)
Diana Miletich (AT,R)
Dominique Hougardy (ALA++,AT)
Elisabeth Colon (AT)
Elodie Lerens (AT++,ALA,SM++)
Emily Delespaux (AT)
Erwan Guillery (AT+)
Evelyne Treinen (AT,SP)
Frank Van Overwalle (SP)
Gaëlle Meert (AT,AS,R)
Geert-Jan Will (AT)
George Mangun (SP)
Gilles Vannuscorps (AT++,SP,CP,SM)
Gloria Wan (ALA)
Goedelle Van Belle (AT)
Guy Lories (IPP,CP)
Hanna Damasio (IPP,SP)
Isabelle Legrain (ALA++)
Jean-Louis Thonnard (AT)
Jessica Wang (AT,SP)
Joan Liu (AT)
Karl-Andrew Woltin (CP,SP)
Laétitia Leloup (AT,SM)
Laurence Dricot (AT+,AS++)
Lei Liew (AT++,ALA,SP,CP)
Lisa Aziz-Zadeh (AT,SP+,CP)
Lisa Quenon (AT)
Lize De Coster (AT)
Marcel Brass (SP,CP)
Mariane Frenay (CP)
Marie Alsamour (AT)
Marie Gryspeert (AT)
Martin Edwards (AT,CP, ALA)
Martine Janssens (ALA)

Massimo Silvetti (IPP,CP)
Mauro Pesenti (AT,IPP)
Maxime Résibois (AT+,AS,SP)
Meike Ramon (AT,SP)
Michael Andres (AT,CP)
Mona Sobhani (AT)
Moïra Mikolajczak (SP,CP)
Nicolas Masson (AT++)
Nicolas Michaux (AT++)
Nicolas Vermeulen (AT,CP,SP,IPP)
Noémie Baudoin (AT)
Olivier Corneille (SP,CP)
Olivier Luminet (SP,CP)
Pierre Maurage (AT,CP)
Pierre-Alexandre Klein (AT+,CP)
Renaud Laguesse (AT++)
Rodrigo Araneda (AT+)
Rolando Jaumain (ALA)
Savio Wong (AT)
Séverine Balon (AT)
Silvia Bunge (SP)
Stéphane Grade (AT++)
Susan Lynch (ALA)
Susanne Quadflieg (AT,AS,CP,SP)
Sylvie Nozaradan (AT+)
Terry Eskenazy (AT,CP,SP)
Thomas Busigny (AT++)
Tong Sheng (AT++,ALA,SP)
Valérie Dehon (AT)
Valérie Dormal (AT)
Valérie Goffaux (AT,CP,SP)
Valéry Legrain (AT)
Vilay Khandelwal (AT)
Vincent Théate (AT++)
Vincent Yzerbyt (SP)
Xiaofei Yang (AT)
Yolande Nivaille (ALA++)

Mis à part mes collègues, il est impératif que je remercie mes parents et beaux-parents pour leur compréhension et leur soutien inébranlable. Je suis particulièrement reconnaissant envers ma mère pour m'avoir donné les moyens d'atteindre (peut-être) mes ambitions. Je remercie également mes amis, frères, et ex-collocs (Aline, Alex, Anto, Cam, Jon, Laurent, Marine, Manu, Palo, Raph, Sim, Tad) pour avoir supporté mes horaires parfois nocturnes et mon manque de disponibilité et pour avoir malgré cela porté une oreille attentive durant les hauts et bas de ma thèse. Last but not least, je ne remercierai jamais assez Elodie pour m'avoir rejoint dans cette aventure et y avoir apporté tant de bonheur et de sagesse !

For the sake of Science,

Chapter 1

General introduction

General introduction

We have – of course – no immediate experience of what other men feel; so the only way we can get an idea of what someone else is feeling is by thinking about what we would feel if we were in his situation … Adam Smith, The theory of moral sentiments, 1759

There is a world invisible to us. This world encompasses the intentions, desires, beliefs, and emotions of other human beings. We have no access to what others are thinking nor any means to ascertain that they are actually thinking. When did we realize that this invisible world exists? When did we start to understand that other people's sounds and movements are ruled by abstract representations such as intentions, beliefs, and knowledge? The answer is still far from clear, because we have no access to what children are thinking (Heyes, 2014a; Scholl & Leslie, 2001; Wellman, Cross, & Watson, 2001). Nevertheless, developmental psychologists have designed tests to assess whether children impute mental states to other social agents. I will present the two historically most famous tests. The first test is called the False Belief task (Wimmer & Perner, 1983) and consists in asking children where another child named Maxi will look for his chocolate after they have seen that, while Maxi was away, his mother moved the chocolate from where Maxi had put it (location A) to another place (location B). To pass this test, children must indicate that Maxi will erroneously go to location A to find his chocolate despite the fact that they know that the chocolate is in location B. The second test is called the Three Mountains task (Piaget & Inhelder, 1948) and consists in asking children facing a miniature model of three mountains how a doll sitting at the other side of the model sees the three mountains. To pass this test, children must pick the card depicting how the three mountains look from the doll's differing visual perspective. Successful performance in these two tasks is assumed to reflect the ability to impute mental states and to understand that others may have mental experiences of their own that are thus different from what we know or see from our egocentric perspective. This ability has received several names depending on the fields of the researchers who have studied it. Theory of mind (ToM), perspective taking (PT), mentalizing, folk psychology, and cognitive empathy are, in descending order, the terms most often used to refer to this ability. In practice and in this thesis, ToM refers to the general ability to ascribe mental states to others (Premack & Woodruff, 1978) whereas PT refers to the ability to *non-egocentrically* ascribe mental states to others. ToM and PT thus particularly refer to the inferential process and the capacity to decentre from the egocentric perspective, respectively. Throughout my thesis, I will present my work that is essentially related to PT but I will also often refer to ToM as an umbrella concept that includes PT as a specific ability among others. Finally, a close neighbour to PT and ToM is empathy in the sense that empathy allows to feel and understand the emotional state of another person (Preston & de Waal, 2002). However, PT and ToM are not about feeling but understanding and refer to the understanding of all mental states rather than emotional states only. The division between affective and cognitive empathy is sometimes adopted to clearly dissociate the ability to feel another person's emotional state (also referred to as emotional contagion) and the ability to understand another person's emotional state, respectively (Shamay-Tsoory, Aharon-Peretz, & Perry, 2009).

If a child performs successfully in either the False Belief task or the Three mountains task, it is assumed that the child has acquired a mature ToM ability. However, tasks assessing mental state inference have varying orders of sophistication and assess different facets of ToM. Thus, while six-year old children have good performance in the False Belief task, they may have poor performance in another ToM task. For example, in a task called Strange Stories (Happé, 1994), six-year-old children face more difficulties when asked what a war prisoner who wants to mislead the enemy about the location of his army will say if he knows that the enemy knows he will be lying. Accordingly, at this age ToM and PT abilities are still developing and it is not until adulthood that successful performance in complex tasks is expected. Adulthood is thus considered as the end point of ToM and PT development.

1. Are adults flawless perspective-takers?

For decades, in order to study the development of children's PT ability, developmental psychologists designed tasks in which adults systematically displayed ceiling performance. Studies from developmental psychology have consistently shown that adults are able to succeed on relatively complex PT tasks. This observation was not deemed surprising given that adulthood was considered as the end point of PT development. However, researchers from social psychology have shown that adults do not always fully exploit their full-fledged PT ability and make social judgments that are egocentrically biased. This egocentric bias has received several names such as the curse of knowledge, the illusion of transparency, or the false consensus effect. The illusion of transparency describes adults' tendency to overestimate how transparent to others are their mental states such as their emotions (Gilovich et al., 1998) and their preferences in negotiations (Boven, Gilovich, & Medvec, 2003). The curse of knowledge describes adults' failure to completely ignore privileged knowledge when asked to the take the perspective of a naïve person when making estimates concerning, for examples, the likelihood of historical events (Fischhoff, 1975), earnings of a company (Camerer, Loewenstein, & Weber, 1989), the sarcasm of a message (Keysar, 1994), the value of a company's share (Keysar, Ginzel, & Bazerman, 1995), or the meaning of unfamiliar idioms (Keysar & Bly, 1995). The false-consensus effect describes adults' tendency to overestimate the extent to which other people share their own characteristics, opinions and decisions such as the decision to contest a fine (Ross, Greene, & House, 1977) or their answers in a personality test (Krueger & Clement, 1994). Other similar biases in social psychology have been reported (Epley & Caruso, 2008; Royzman, Cassidy, & Baron, 2003) but they all describe adults' tendency to rely on what they think or experience from their egocentric perspective to infer other people's mental states.

It would therefore seem that adults are far from flawless perspective-takers. But why are we not always using our full-fledged PT ability? A dominant interpretation originates from the discovery that, to avoid effortful and lengthy thinking, humans often reason by making approximations, called heuristics (Tversky & Kahneman, 1974). Egocentric biases have been proposed to originated from the tendency to use two of these heuristics: the anchoring and the accessibility heuristics (Epley, Keysar, Van Boven, & Gilovich, 2004). Together, they refer to the tendency to rely on the most accessible source of information as a basis, or anchor, to make estimates about particular topics irrespectively of the relevance of the anchor (Tversky & Kahneman, 1974). For example, when asked to estimate the number of African countries in the United Nations, healthy adults tended to provide an estimate close to a random number they had just obtained on a wheel of fortune (Tversky & Kahneman, 1974). Applied to PT, the egocentric perspective is viewed as the most accessible source of information, which serves as an anchor for inferring others' mental states.

In parallel to social psychology, interest for PT among healthy adults emerged also from cognitive psychology and psycholinguistics. The analysis of word utterances and eye-movements in real-time conversations and of reaction times (RTs) under time-pressured situations allowed to reveal subtle egocentric biases, which are often referred to as egocentric errors or egocentric interferences. For example, studies from cognitive psychology show that adults tend to be slower at judging what another person might perceive or think when what they experience or think from their egocentric perspective is conflicting with the other person's perspective relatively to when perspectives are not conflicting (Apperly, Back, Samson, & France, 2008; Samson et al., 2010; A. D. R. Surtees & Apperly, 2012).

Similarly, studies from psycholinguistics show that adults often indicate objects to another person by referring to descriptions irrelevant to the addressee's understanding (Heller, Gorman, & Tanenhaus, 2012; Horton & Keysar, 1996; Kaland, Krahmer, & Swerts, 2011; Lane, Groisman, & Ferreira, 2006; Wu & Keysar, 2007b) or that adults tend to look at objects that a speaker cannot see in response to a speaker' reference to another object (see Figure 1; Barr, 2008; Hanna, Tanenhaus, & Trueswell, 2003; Keysar, Barr, Balin, & Brauner, 2000; Keysar, Lin, & Barr, 2003). In line with social psychologists, these findings have been interpreted as resulting from the natural use of the egocentric frame of reference to infer what others are talking about because it is a cognitively less costly strategy and because potential egocentric mishaps can be adjusted afterwards if needed (Keysar et al., 2000, 2003).

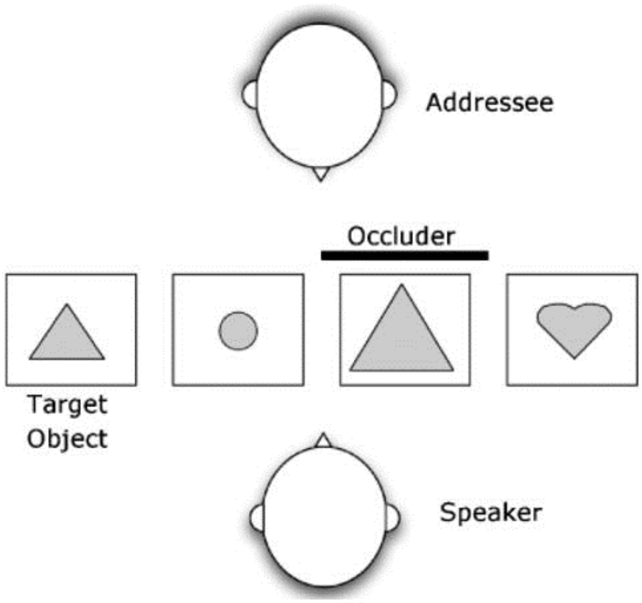


Figure 1. Experimental setup of a PT task used in psycholinguistics, reproduced from Wardlow Lane et al. (2006). The participant is the speaker and he must ask the addressee to give him the small triangle while having privileged knowledge that there is also a big triangle. Note that in a similar setup used by Keysar et al. (2000) the participant is the addressee and the big triangle is hidden to the speaker's (here called director) visual perspective.

To sum up, although adults have a full-fledged PT ability, there is a vast amount of findings showing that adults are not flawless perspective-takers because they are egocentrically biased. The dominant interpretation is that "*One's own perspective is typically immediate, automatic, and easy, whereas reasoning about another's perspective is typically slow, deliberate, and difficult.*" (Epley & Caruso, 2008). Critically, the theoretical consensus assumes that PT is a one-dimensional ability since the unique and key ability considered to underpin PT performance is the ability to adjust the egocentric mental state initially imputed to adequate it with a more plausible estimate of someone else's mental state; this adjustment is cognitively effortful and therefore not always made (Epley et al., 2004; Gilovich & Savitsky, 1999; Tamir & Mitchell, 2010).

2. What influences adults' performance in taking another person's perspective?

Numerous studies from developmental psychology have investigated what factors could influence PT performance in children. These studies have highlighted that according to their differences in terms of age, country, socio-economical level, parenting practice, verbal ability, fantasy play, or executive functioning, children could have strikingly different PT performances (e.g., Carlson, Moses, & Breton, 2002; Farrant, Devine, Maybery, & Fletcher, 2012; Hughes et al., 2012; Taylor & Carlson, 1997; Wellman et al., 2001).

In contrast, the investigation of differences in PT among healthy adults originated essentially from social psychology and was essentially studied in relation to trait-like, or enduring, characteristics such as personality traits or behavioural tendencies. These studies assessed PT almost exclusively by means of questionnaires measuring self-reported perspective-taking habits. The most widely-used questionnaire on perspective taking is the Interpersonal Reactivity Scale (IRI; Davis, 1980). The IRI provides scores of agreement on several statements related to empathic experiences and habits, including 7 statements specifically related to PT (referred to as PT-IRI). For example, one of these 7 statements is “I try to look at everybody's side of a disagreement before I make a decision”. In the non-clinical population, PT-IRI scores are positively correlated with individual differences in measures of self-esteem (Davis, 1983), proneness to experience guilt (Joireman, 2004; Leith & Baumeister, 1998), prosocial behaviour (Carlo, Allen, & Buhman, 1999), propensity to forgive (Rizkalla, Wertheim, & Hodgson, 2008), age (O’Brien, Konrath, Grühn, & Hagen, 2013), the level of glutamate in the prefrontal cortex (Montag, Schubert, Heinz, & Gallinat, 2008), the likelihood of choosing the psychology major (Harton & Lyons, 2003) and the likelihood of reaching a deal in negotiations (Galinsky, Maddux, Gilin, & White, 2008). Furthermore, IRI-PT scores are negatively correlated with individual differences in measures of proneness to anger (Mohr, Howells, Gerace, Day, & Wharton, 2007), dispositional hostility (Loudin, Loukas, & Robinson, 2003; Richardson, Hammock, Smith, Gardner, & Signo, 1994), narcissism (Delič, Novak, Kovačič, & Avsec, 2011; Hepper, Hart, & Sedikides, 2014), avoiding attachment (Corcoran & Mallinckrodt, 2000), alexithymia (Grynberg, Luminet, Corneille, Grèzes, & Berthoz, 2010), destructive conflict resolution (Arriaga & Rusbult, 1998) and social dominance orientation (Pratto, Sidanius, Stallworth, & Malle, 1994).

In contrast to questionnaire studies, individual differences in PT performance measured through behavioural tasks in the non-clinical adult population are scarce: PT performance has been positively associated with executive functioning (working memory and inhibitory control; Brown-Schmidt, 2009; Lin, Keysar, & Epley, 2010; Wardlow, 2013), relationship satisfaction and closeness (Schröder-Abé & Schütz, 2011), and cultural interdependence (China vs. USA; Wu & Keysar, 2007a) and negatively associated with aging (T. P. German & Hehman, 2006), schizotypy (Langdon & Coltheart, 1999, 2001) and alexithymia (Wastell & Taylor, 2002). Irrespective of the method, however, given that PT was measured to predict scores on static trait-like characteristics or dispositions, it was implicitly assumed that PT itself was a static trait-like characteristic or disposition. In addition, individual differences have so far been captured through single scores of PT, where individuals could vary only along a one-dimensional continuum and could be classified as either poor or good perspective-takers.

The view that the ability to take another person’s perspective is *static* and *one-dimensional* seems however to be progressively more compromised in regard of some more recent findings. The findings compromising the view of PT as a static and one-dimensional ability are reviewed in turns in the two following sections.

3. Beyond a static view

Research from developmental psychology has focused on the development of children's PT *abilities* (i.e., what they are able to do) and, given the high diversity of tasks and task variations used, some researchers have looked at the influence of the PT tasks parameters as potential transient situational factors influencing PT performance. For example, a meta-analysis of children's performance in the False Belief task revealed that, irrespectively of their age, the level of active engagement of children in the story and the level of salience of the protagonist's false belief (e.g., whether it is stated in the test question that the protagonist has a belief or whether a thought bubble is drawn over the protagonist in the drawing version of False Belief test to indicate that the protagonist has a belief) significantly influenced children's performance (Wellman et al., 2001)

In social psychology, PT performance has been theorized with regard to heuristics theory and therefore has been measured as a *tendency* (i.e., what healthy adults actually do usually; Tversky & Kahneman, 1974). Paradoxically, however, given the important focus on individual differences, very few studies looked at the influence of transient factors on adult PT performance. Nevertheless, the malleability of PT performance has been largely supported by demonstrations that PT performance can be altered following priming manipulations or direct PT instructions.

PT performance was found to be influenced under priming manipulations such as when priming a sense of high or low power (Galinsky, Magee, Inesi, & Gruenfeld, 2006), a low versus high social status (Rutherford, 2004), a focus on perceptual dissimilarities versus similarities (Todd, Hanko, Galinsky, & Mussweiler, 2011), or the benefits of multiculturalism versus colour-blindness (Todd & Galinsky, 2012).

Further evidence of malleability comes from the studies that exploited PT as an independent variable by explicitly instructing participants to make the effort of engaging in taking another person's or another group's perspective (for a review, see Todd & Galinsky, 2014). Accordingly, participants who received explicit perspective-taking instructions (versus no instruction or objective perspective instructions) before describing, watching, or reading about another person or group's life or characteristics were found to provide less stereotypic descriptions (Dovidio et al., 2004; Ku, Wang, & Galinsky, 2010), to express more stereotypic descriptions or behaviours (Galinsky & Moskowitz, 2000; Galinsky, Wang, & Ku, 2008; Skorinko & Sinclair, 2013), to have more positive attitudes towards the other person or group (Batson, Polycarpou, Harmon-Jones, & Imhoff, 1997; Bruneau & Saxe, 2012; Finlay & Stephan, 2000; Vescio, Sechrist, & Paolucci, 2003), to show more positive implicit associations with other person or group (Todd, Bodenhausen, Richeson, & Galinsky, 2011; Todd & Burgmer, 2013), to be more likely to acknowledge inequalities or discriminations towards another group (Todd, Bodenhausen, & Galinsky, 2012), to be more willing to engage in contact with negatively-stereotyped or stigmatized individuals (C. S. Wang, Kenneth, Ku, & Galinsky, 2014), to more automatically imitate an out-group member's movements (Müller et al., 2011), or to perceive another person or group as more similar or close (Davis, Conklin, Smith, & Luce, 1996; Galinsky & Moskowitz, 2000; Laurent & Myers, 2011).

Altogether, empirical evidence from social psychology clearly supports the idea that PT performance is malleable but the influential factors investigated so far are experimental methods that do not reflect real-life transient factors; which therefore does not directly compromise the view that our everyday PT performance is stable, or static.

However, in psycholinguistics and cognitive psychology, a few recent studies have looked at three important transient situational factors: the cognitive resource availability of executive functions, the salience of egocentric information, and the overlap of information between perspectives. Firstly, in situations where participants performed a task taxing working memory or inhibitory control prior to or in parallel with a PT task, participants were found with poorer PT performance (Fennis, 2011; T. P. German & Hehman, 2006; Lin et al., 2010; Newton & de Villiers, 2007; Qureshi, Apperly, & Samson, 2010). Secondly, adults were found with poorer PT performance when increasing the salience of egocentric information (privileged knowledge) by increasing the motivation to conceal privileged information (Kaland et al., 2011; Lane et al., 2006; Lane & Liersch, 2012) or increasing the requirement to pay attention to egocentric information (Lane & Ferreira, 2008). Thirdly, Wu and Keysar (2007b) showed that increasing the degree of perceived overlap between the egocentric and another person's visual perspective increased adults' failure to not refer to privileged information. Altogether, these findings are informative about the underlying factors that may influence PT performance (and are discussed in the next section) but are relatively opaque to point out real-life situations through which PT performance may change.

Finally, the most direct demonstration that PT performance fluctuates in everyday life comes from two studies that looked at the impact of individuals' emotional state on PT performance. The first study induced feelings of sadness or happiness and found poorer PT performance among the participants of the happiness induction condition (Converse, Lin, Keysar, & Epley, 2008). The second study induced feelings of guilt and shame and found better PT performance among the participants of the guilt induction condition (Yang, Yang, & Chiou, 2010).

To sum up, previous studies largely focused on individual differences or on manipulating PT through explicit instructions. Hence, very few studies have highlighted the dynamic nature of PT performance in the sense that one can have different PT performances from one everyday life situation to another and from one moment to another. This thesis aims to explore this new avenue of research.

4. Beyond a one-dimensional view

Whereas in social psychology PT performance was thought to be determined uniquely by our ability to adequately adjust our initial reliance upon our egocentric perspective

(Epley et al., 2004; Gilovich & Savitsky, 1999; Tamir & Mitchell, 2010), multidimensional conceptions of PT had been proposed early on in developmental psychology. The most influential model has been formulated by Leslie (Leslie, Friedman, & German, 2004; Leslie, 1987). Leslie proposed that there are two central abilities underpinning PT: an innate and modular ToM ability, called ToM Mechanism (ToMM), that allows us to pay attention to people and infer mental states from their behaviour based on the most salient information, and a later developing domain-general ability, called Selection Process (SP), that allows us to select what information to use to infer mental states thanks to executive functioning. Given that the most salient information is always considered to be one's own mental state (i.e., egocentric perspective), when one's own mental state cannot explain another person's behaviour (e.g., in the False Belief task), it is proposed that the SP intervenes by inhibiting the salient egocentric information (e.g., I know the chocolate is in location B) to select an alternative and more suitable mental state to impute (e.g., Maxi believes that the chocolate is in location A). However, it must be acknowledged that there is an on-going debate about whether the ToMM is innate and whether children's ability to pass the False Belief test results from the maturity of the SP (performance hypothesis; Chandler, Fritz, & Hala, 1989; Fodor, 1992; Scholl & Leslie, 2001). Some authors argue that there is no innate ToM module and therefore propose that the children's ability to pass the False Belief test results from a conceptual change occurring in the development that allows children to represent others' mental states as independent from their own reality, that is to say, from their own egocentric view of the world (competence hypothesis; Perner, 1995; Wellman et al., 2001).

Irrespective of whether ToM is innate or not, Leslie's model is a one-dimensional model when applied to adults since the ToMM is supposed to be fully developed at adulthood. One exception concerns the SP, which refers to the same effortful and controlled adjustment process proposed by several social psychologists (Epley et al., 2004) and underpinned by executive functions (T. P. German & Hehman, 2006; Lin et al., 2010). Importantly, and in line with interpretations from social psychology and psycholinguistics, this model assumes that our egocentric perspective is the most salient candidate mental state imputed to others.

However, some recent studies conducted on infants and adults suggest that the egocentric perspective is not always the most salient mental state. Instead, the perspective of another person, which we call the *altercentric* perspective (*alter* means "other" in Latin), might be equally or more salient than the egocentric perspective. Experiments conducted on infants, with therefore immature executive functioning to inhibit their egocentric perspective, have revealed that these infants behaved as if they had imputed a non-egocentric mental state to a social agent. The first study to provide such evidence comes from Onishi and Baillargeon (2005) who showed that 15-months infants were less surprised (as measured by looking times) to see a social agent looking for an object in the location where the social agent erroneously believed the object was than in the location where only the infants knew the object was. This finding led authors to infer that the infants had understood that the social agent has a false belief about the location of the object and thus expected he would go to the wrong location. Similar findings were found with slight variations of the False Belief task (for a review, see Baillargeon, Scott, & He, 2010) by measuring anticipatory looking (Senju, Southgate, Snape, Leonard, & Csibra, 2011; Southgate, Senju, & Csibra, 2007), violations of expectations (looking times; Kovács, Téglás, & Endress, 2010; Sodian, Thoermer, & Metz, 2007; Song & Baillargeon, 2008; Song, Onishi, Baillargeon, & Fisher, 2008; Surian, Caldi, & Sperber, 2007), or which location the infants will go to help the social agent holding the false belief (Buttelmann, Carpenter, & Tomasello, 2009; Southgate, Chevallier, & Csibra, 2010). In sum, infants behaved as if they had correctly imputed to a social agent a mental state that was conflicting with their reality of the world. Importantly, given that infants have immature executive functioning and are limited in their ability to select information, they process information that is the most salient (or accessible) to them. Consequently, infants must have been able to infer the social agent's mental states because the information needed to construe the social agent's mental state was more salient (and therefore prioritized) than the information pertaining to their egocentric view of the world.

In adults, studies have also reported findings supporting a low salience of the egocentric perspective relatively to the altercentric perspective (i.e., the perspective of another person). Given that adults do possess mature EF, evidence comes from the observation that adults seem to automatically compute another person's mental state. This automatic computation of another person's mental state has been evidenced in two PT tasks: the False Belief task (Kovács et al., 2010; Schneider, Nott, & Dux, 2014; van der Wel, Sebanz, Knoblich, & Wel, 2014) and the dot visual PT task (Samson et al., 2010; Santiesteban, Catmur, Coughlan Hopkins, Bird, & Heyes, 2013; A. D. R. Surtees & Apperly, 2012), which is an adaptation of the Three Mountains task designed by Piaget (Piaget & Inhelder, 1948). For example, Kovács et al. (2010) have instructed participants to press a key when they see a ball revealed behind a screen. Before that box is removed, they see if the ball gets behind the screen and an irrelevant social agent could sometimes see or not see where the ball eventually went. When the social agent could not see it, the agent held a false belief of whether the ball is behind the screen or not. Although whether the ball gets behind the screen was not predictive of whether the ball would be behind the screen once the screen was removed, participants were faster to detect the ball when they had previously seen the ball getting behind the screen than when the ball did not get behind the screen. The key finding was that they were also faster when the social agent had seen the ball getting behind the screen despite the fact that, after the agent left the scene, they had seen that the ball eventually left the screen before the screen was removed. This finding was suggested to reflect that the social agent's belief was automatically computed and influenced participants' behaviour. In the same line of evidence, Samson et al. (2010) have shown that adults were slower and made more errors when making judgments about their egocentric visual experience when another person, irrelevant to the task (in Experiment 3), had a different visual experience; which suggests that what another person could see was automatically computed and influenced participants' behaviour as if what the other person was seeing confused their judgement about their egocentric visual experience. These studies, along with several replications (McCleery, Surtees, Graham, Richards, & Apperly, 2011; Qureshi et al., 2010; Ramsey, Hansen, Apperly, & Samson, 2013; Senju, Southgate, White, & Frith, 2009; A. D. R. Surtees & Apperly, 2012) and similar findings on other tasks (Sebanz, Knoblich, & Prinz, 2003; Zwickel, 2009), strongly support the view that the altercentric perspective is sometimes automatically computed.

These findings suggesting appropriate PT performance in infants and automatic PT in adults have been recently accounted for in a multidimensional model proposed by Apperly and Butterfill (2009; see also Mitchell, Currie, & Ziegler, 2009). Following this model, PT is underpinned by two independent systems: A slow, deliberate, difficult but also more controlled and flexible system, and a rapid, automatic, efficient but cognitively limited and non-flexible system (Apperly & Butterfill, 2009; see also Gilbert, 1989; Satpute & Lieberman, 2006). The second system is specialized to attend, construe, and remember unique associations between a social agent, the object he interacts with, and the location of the interaction. These associations, called *registrations*, would form a sufficient basis for infants to pass several PT tasks and for adults to automatically construe what another person thinks or experiences. These associations are not mental state per se and can be used in a cognitively limited range of PT situations. Importantly, the same children were found with opposing performance in the same false belief task depending on whether anticipatory looking or verbal responses were measured (Clements & Perner, 1994); which was interpreted as evidence that the efficient and flexible systems are independent (see also Ruffman, Garnham, Import, & Connolly, 2001; for a review, see Schneider, Slaughter, & Dux, 2014). Although this model provides an elegant account of the recent findings and is multidimensional, the two systems are expected to intervene alone, one for each type of PT. Therefore, this dual-system model is actually composed of two disconnected one-dimensional accounts of PT performance.

An alternative (but quite complementary) account to the findings of infants' success on PT tasks and adults' automatic PT is that these findings reflect situations in which the egocentric information was less or as salient as the information needed to construe the altercentric perspective. Although the egocentric perspective is consensually viewed as an invariable obstacle to take another person's perspective because of its high accessibility (Epley et al., 2004) or its high salience (Leslie et al., 2004), several studies managed to change the salience (or accessibility) of the information pertaining to our egocentric perspective. For examples, increasing the requirement to pay attention to the egocentric information (Kaland et al., 2011; Lane & Ferreira, 2008; Lane et al., 2006; Lane & Liersch, 2012) and making egocentric information accessible only once the altercentric perspective has been inferred (Bailey & Henry, 2008; Samson, Apperly, Kathirgamanathan, & Humphreys, 2005; van der Meer, Groenewold, Nolen, Pijnenborg, & Aleman, 2011) affected PT performance. Based on these encouraging preliminary findings, we propose to investigate whether the view that the egocentric perspective is always the most salient source of information for mental state inference by manipulating what information individuals are required to pay attention to (Chapter 2) and by capturing PT performances that are specifically due to the relative salience of the egocentric and altercentric perspectives (Chapters 3, 4, and 5).

If we were to provide evidence that manipulating and assessing the relative salience of information pertaining to the egocentric and altercentric perspectives is possible, meaningful, and predictive of PT performance, we would find a new dimension underpinning PT performance that has never been assessed before. The salience of information is however unlikely to be fully predictive of adult PT performance given that this salience can be modified in a top-down controlled fashion by executive functions abilities when, for instance, the egocentric perspective is salient and conflicts with the altercentric perspective (T. P. German & Hehman, 2006; Lin et al., 2010). Therefore, our ability to modify this salience (i.e., to suppress irrelevant information and select relevant information) to overcome conflicts between perspectives is a critical additional dimension that should be assessed along with the relative salience of the egocentric and altercentric perspectives. This two-dimensional account would be able to explain PT performance both in terms of the domain-general ability to inhibit the egocentric perspective and in terms of the relative salience of the egocentric and altercentric perspectives. Introducing and investigating the predictive strength of this multidimensional account is the second main objective of this thesis.

In the two following sections I introduce the main experimental task of the thesis and its theoretical relevance to the objectives of my thesis.

5. Visual perspective taking

There is mounting evidence that, irrespective of the mental state to infer, PT performance is often dependent on the ability to handle our conflicting egocentric perspective and I have proposed in addition that the relative salience of the egocentric and someone else’s perspective should be another critical dimension underpinning PT performance irrespective of the mental state to infer. However, we have seen so far that PT entails the inference of many different mental states; they can be beliefs, knowledge, intentions, and visual, tactile or emotional experiences. Thus, the inferential process can be very different depending on the mental state to infer. Accordingly, the inferential process might be facilitated if the perspective-taker has already (1) some knowledge or experience of what the other person is experiencing, (2) learned many of the infinite causal relations proper to the social domain (e.g., if someone slams a door, it means that something or someone angered him), or (3) good reasoning skills to apprehend the other person’s situation in its full complexity. The dependence on these other abilities should strongly vary following the type of mental state to infer; which impedes the study of PT. Hence, an adequate measure of PT performance should aim to reduce the complexity of the inferential process to its minimum. This is why visual perspectives-taking (VPT) is probably one of the most adequate types of PT to study.

The inferential process of what another person is looking at is considered to develop the earliest (Flavell, 2004) and has even been proposed to be largely modular and innate (Baron-Cohen, 1995). Accordingly, in their first year, infants pay more attention to the eyes than other parts of the face (Maurer, 1985) and start to follow where others' eyes are looking (Hood, Willen, & Driver, 1998). During their second year, they follow less another person's head turns towards an object when the person cannot see the object such as when the person is blindfolded or when an opaque screen occlude his line of sight (Brooks & Meltzoff, 2002; Butler, Caron, & Brooks, 2000). Moreover, two-year-old children check whether adults look where they point (Butterworth, 1991; Franco & Butterworth, 1996) and actively put their drawings in adults' line of sight (Lempers, Flavell, & Flavell, 1977).

Successful VPT performance (i.e., the ability to non-egocentrically infer the other person's visual perspective) was initially evidenced with the Three Mountains test among seven-year-old children (Piaget & Inhelder, 1948) but successful VPT was also found, later on, in four- and even two-year-old children in a simplified version of this test (Flavell, Everett, Croft, & Flavell, 1981; Moll & Tomasello, 2006). This discrepancy of PT performance across different versions of VPT tasks led Flavell and collaborators (1981) to distinguish two levels of VPT complexity: Level 1 VPT allows inferring which objects someone else can or cannot see and level 2 VPT allows inferring how an object looks from someone else's visual perspective (e.g. whether a “9” looks like a “6” to someone else's perspective). Level 1 VPT requires a very basic inferential process, which consists in drawing a mental line (of sight) from a person to an object to judge whether the object is visible from his visual perspective (Michelon & Zacks, 2006). Level 1 VPT is found in two-year-old children (Baron-Cohen, 1989; Leslie & Frith, 1988; Moll & Tomasello, 2006) and among several non-human primates (Bräuer, Call, & Tomasello, 2007; Shillito, Shumaker, Gallup Jr, & Beck, 2005), mammals such as dogs (Bräuer, Call, & Tomasello, 2004; Hare, Brown, Williamson, & Tomasello, 2002), marmosets (Burkart & Heschl, 2007) and goats (Kaminski, Riedel, Call, & Tomasello, 2005), and even among some bird species (Emery & Clayton, 2004). In contrast, level 2 VPT requires a more cognitively effortful inferential process because the perspective-taker must mentally rotate to align with another person's visual perspective (Kessler & Rutherford, 2010; Michelon & Zacks, 2006; A. Surtees, Apperly, & Samson, 2013); which is probably why level 2 VPT is not found in children under 4 years of age (Flavell et al., 1981; Masangkay et al., 1974) and has never been found in other species.

To sum up, level 1 VPT is likely to be the type of PT that is best suited to study the core mechanisms or dimensions underpinning PT performance because the inferential process of level 1 VPT is very basic and efficient and thus less prone to be influenced by experimental factors, which would otherwise reduce the generalizability of our findings to other types of PT.

6. The dot visual perspective-taking task

From the beginning to the end of this thesis I consistently used the dot VPT task designed by Samson et al. (2010), which will be referred to as the VPT task in this thesis. The main interests of this task are twofold: First, it measures level 1 VPT, which we have seen is the form of PT best suited to optimize the generalizability of our potential findings to other forms of PT. Second, it allows to separately assess the two dimensions underpinning PT we focus on.

In the VPT task, participants are instructed to make judgments from either their own or someone else's visual perspective in situations where both perspectives are either conflicting (i.e., inconsistent) or consistent (see Figure 2 for details). By contrasting orthogonally the perspective taken (self-perspective vs. other-perspective) and whether what is visible from both perspectives is different or not (consistent vs. inconsistent), we could obtain two measures of PT performance that respectively and specifically assess the ability to handle conflicting perspectives and the relative priority given to the egocentric and altercentric perspective (for a detailed technical explanation of how the VPT task assess the latter dimension, see Appendix A).

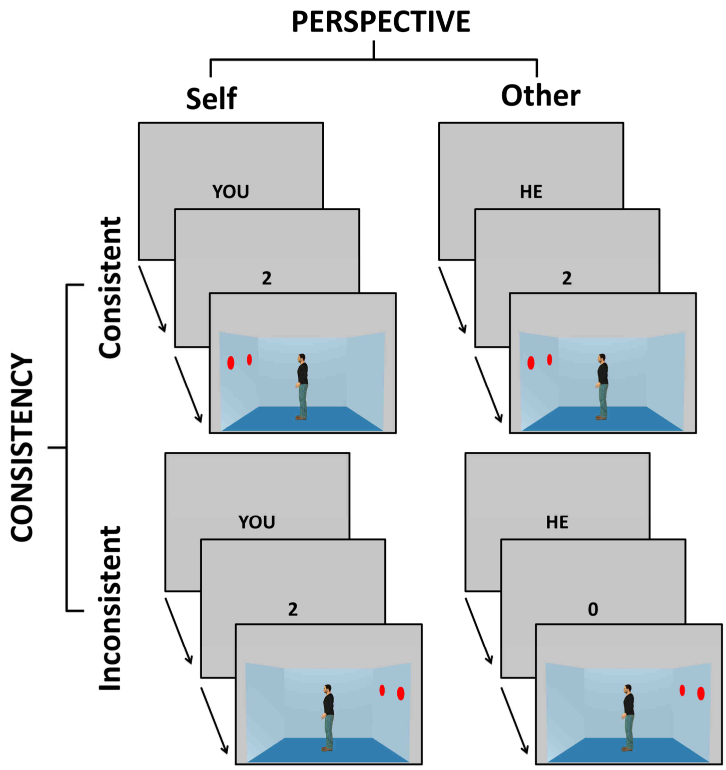


Figure 2. Examples of trials used in the VPT task in the different experimental conditions. Participants were asked to judge whether the number prompt (ranging from 0 to 3) matches the number of discs visible from the prompted perspective, which could be either their own perspective

(self-perspective condition) or the perspective of the person in the room (other-perspective condition). The other person and the participants could see either the same number of discs (consistent condition) or a different number of discs (inconsistent condition).

Performance along these two dimensions is measured through reaction times (RT) and error rates (ER). Longer RTs and/or a higher ER when the egocentric and altercentric perspectives are inconsistent than when they are consistent reflect the higher difficulty, or cognitive cost, in handling the conflict between perspectives. Longer RTs and/or a higher ER when prompted to take the self- perspective than when instructed to take the other person's perspective reflect a relative higher difficulty, or cognitive cost, in taking the egocentric perspective over the altercentric perspective. However, because there is no baseline condition in this experimental task design, the latter observation could also be framed as a lower difficulty, or cognitive cost in taking the altercentric perspective over the egocentric perspective.

At the individual or group level, expected effects on performance can be found on RTs, on ERs, on both measures, or on neither of them. Variability between these 4 patterns of findings is namely driven by the fact that, from one situation to another and from one individual to another, individuals may favour speed over accuracy, or inversely, in their goal to attain successful performance (e.g., Förster, Higgins, & Bianco, 2003). Moreover, the size and direction of an effect found on one measure may need to be revised downward or upward if the opposite effect or the same effect is found on the other measure, respectively. One way to tackle this issue is to use the inverse efficiency score (IES) because it combines ERs and RTs by weighting the average RT by the ER (IES = RT / (1-ER); Townsend & Ashby, 1978). More specifically, using the IES allows to take into account the potential speed-accuracy trade-offs, to homogenize the different patterns of speed-accuracy trade-offs within a group of individuals, and to compare several groups via a unique measure. However, the IES presents the main disadvantage that its variability is increased because it adds up the sampling error of the two measures and because the RTs are non-linearly multiplied (almost exponentially) as the ERs increase (e.g., an increment of ER from .10 to .20 and from .40 to .50 increases the RT by 69 ms and 167 ms, respectively). This non-linear multiplication of RTs led Bruyer and Brysbaert (2011) to argue that the use of the IES should be avoided if the average ER is beyond .10 and when the results found on the RTs and ERs are not in line with those found on the IESs (Bruyer & Brysbaert, 2011). If these two criteria are met, the analysis of performance on the VPT task will be complemented by analyses on IESs to compare performances between different groups of individuals.

7. Outline of the thesis

This thesis had two main objectives. The first was to investigate the dynamic nature of PT performance in the sense that one can have different PT performances from one situation to another and from one moment to another. This new avenue of research would challenge the widespread view that PT is a static (or trait-like) characteristic and that it should be studied as such. The second objective was to investigate whether the ability to handle conflicting perspectives and the relative salience of the egocentric versus another person's perspective are two core dimensions underpinning PT performance. Providing evidence of the possibility and usefulness of this two-dimensional account of PT would challenge the widespread view that PT is a unitary construct and that it should be studied as such.

In **Chapter 2**, we tested across 3 experiments the role of 3 situational factors in explaining why what another person is looking at interferes more strongly with our judgement of what we see in the VPT task than in the gaze cueing paradigm (i.e., a task where participants must detect or identify an object located either within or outside the line of sight of an irrelevant gazing stimulus). In Experiment 1 we looked at the role of the visual stimuli of the VPT task that could have a different visual salience and may have boosted the interference. In Experiment 2 we looked at the role of the higher task complexity of the VPT task and in Experiment 3 we tested the role of task instructions in influencing the attentional deployment onto another person. This study therefore explored the role of situational factors in influencing PT performance. If such an influence were found, it would support the view that PT performance varies from one situation to another and is therefore a dynamic ability.

In **Chapter 3**, we tested across 2 experiments how inducing an emotional state of guilt, anger, or shame would affect PT performance relatively to individuals induced in a neutral state. Given that emotions are typically transient and recurrent states of the mind, evidence that guilt, anger, or shame impacts on PT performance would support the view that PT is a dynamic ability. Moreover, as PT performance was measured with the VPT task, we also tested whether emotions would affect overall performance (main effect of emotions) or specifically one of the two dimensions we proposed to underpin PT performance. If emotions were to impact specifically one of the dimensions, it would add some theoretical and ecological validity to the two-dimensional account.

In **Chapter 4**, we tested whether and how narcissism affects VPT performance. Narcissism has been consistently negatively association with self-reported PT habits. However, previous studies suggest that PT performance can be enhanced when providing to participants the motivation to engage in PT. Here, we explored whether the tendency to report less PT habits might actually be driven by motivational factors, which could further highlight the dynamic nature of PT. In addition, because narcissists are characterized for their highly self-interested behaviour, we examined whether narcissism would be specifically associated with differences in the relative salience of the egocentric and altercentric perspectives rather than with the other dimension or the overall performance on the VPT task.

In **Chapter 5**, we tested the specific hypothesis that there exists a significant and independent amount of inter-individual variability in both dimensions. To test this hypothesis, we examined how a large number of participants who completed the VPT task would cluster following an algorithm aiming to maximize the explanation of PT inter-individual variability. If we were to find that both dimensions are necessary to describe how individuals cluster and differ in terms of PT performance, it would suggest that inter-individual differences in PT performance (which was traditionally scored along a one-dimensional poor-to good performance continuum) should be scaled up in a two-dimensional space defined by the ability to handle conflicting perspectives and the relative salience of the egocentric and altercentric perspectives.

Finally, in **Chapter 6**, I discuss the theoretical implications of our findings within and outside the field of PT.

Chapter 2

What triggers the computation of what other people are looking at? Revisiting the automaticity hypothesis

Computing what other people are looking at plays a central role in human interactions as it helps understanding what other people want, are about to do, know, or talk about. Two separate lines of research have suggested that such computation occurs automatically. In the context of a visual perspective-taking task in which participants are asked to make judgments based on their own visual perception in the presence of another perceiver, it has been shown that participants automatically compute what the other person is seeing. In the context of an attention orienting paradigm in which participants have to detect a target preceded by a face with averted gaze, it has been shown that participants' attention is automatically shifted in the same direction where the other person is gazing at. Intriguingly, the sensitivity to what someone else is looking at is much higher and more robust in the context of the visual perspective-taking paradigm than in the context of the gaze cueing paradigm. The current study examined the origin of this difference in three experiments. The results showed that the higher robustness of the sensitivity to someone else's gaze in the visual perspective-taking paradigm is not due to a difference in visual settings (Experiment 1) or task complexity (Experiment 2) but that it is caused by how attention is deployed in response to task instructions (Experiment 3). Our results provide important insights into the conditions in which we compute what another person is looking at, and qualify the automaticity of this computation.

What triggers the computation of what other people are looking at? Revisiting the automaticity hypothesis

Henryk Bukowski[1], Jari K. Hietanen[2], Dana Samson[1]
[1]Institut de recherche en sciences psychologiques, Université catholique de Louvain, Louvain-La-Neuve, Belgium
[2]Human Information Processing Laboratory, School of Social Sciences and Humanities, University of Tampere, Finland

1. Introduction

Our ability to compute what people see, known as visual perspective taking (VPT), offers us very useful information during our social interactions (Baron-Cohen, 1995); it helps understanding what other people talk about, what they like or dislike, what they intend to do, and what knowledge or beliefs of the world they form. Thus, VPT is an essential building block of “Theory of Mind”, that is, our ability to reason about other people's mental states (Premack & Woodruff, 1978).

The most basic form of VPT, also referred to as level 1 VPT, allows to infer which objects someone else can or cannot see (as opposed to level 2 VPT which allows to infer that an object may have a different appearance to someone else; Flavell et al., 1981). Level 1 VPT is known to be an early developing ability in children (Flavell et al., 1981) and is available even to nonhuman species (e.g., Hare, Call, Agnetta, & Tomasello, 2000). It has also been proposed that level 1 VPT is achieved via the computation of the other person’s line of sight (Kessler & Rutherford, 2010; Michelon & Zacks, 2006; A. D. R. Surtees, Apperly, & Samson, 2013) and that such computation occurs automatically (Samson et al., 2010). For example, Samson et al. (2010) showed participants pictures of a room with discs pinned on the left and/or right wall and a centrally positioned human avatar facing either the left or the right wall. The discs were displayed in such a way that on half of the trials, some of these discs were not visible to the avatar. The authors found that when the participants were asked to verify the number of discs they could see from their own point of view, they were slowed down and less accurate in their judgments when the number of discs in the room did not match the number of discs that the avatar could see, suggesting that participants automatically processed what the avatar could see even when it was not relevant for their judgment.

Interestingly, in a parallel line of research it has been shown that our attention is reflexively oriented towards what someone else is looking at. This phenomenon is typically observed in a gaze cueing paradigm where participants are faster at detecting or identifying an object when it appears in the gaze direction of a preceding social cue (e.g., eye gaze or head orientation) than when it appears in the opposite direction (Driver et al., 1999; Friesen & Kingstone, 1998a; Hietanen, 1999, 2002; Langton & Bruce, 1999). This attentional cueing is thought to occur automatically in that participants are sensitive to what another person is looking at even when the gaze direction is non-predictive of where the target object will appear (Driver et al., 1999; Friesen & Kingstone, 1998a; Mansfield, Farroni, & Johnson, 2003).

The level 1 VPT and gaze cueing phenomena have been studied in separate lines of research, and it is not entirely clear yet whether these two phenomena share common underlying mechanisms. In other words, do participants compute a “mental” state (what the gazer “sees”) or do they simply extract a directional feature that orients attention? Furthermore, do they compute the same information in both types of paradigms? There is so far no straightforward answer to these questions. On the one hand, some evidence suggests that participants compute a “seeing” mental state when observing the gazer in the gaze cueing paradigm. Teufel et al. (2010) have shown, for example, that when the gazer wore goggles that were told to be opaque, participants’ processing of a subsequent target was much less affected by the gazer’s head orientation than when the gazer wore similar goggles that were told to be transparent. This indicates that participants extract more than just the directional cue when observing the gazer in the gaze cueing paradigm. On the other hand, it has been shown that cues devoid of mental states (such as an arrow) can produce similar effects as a human avatar when participants judge their own visual experience in the VPT paradigm (Santiesteban et al., 2013). This suggests that directional information alone could be sufficient to orient attention in the VPT paradigm, although this does not directly demonstrate that participants did not compute the “seeing” mental state in addition to the directional information when presented with a human avatar. Further research is needed to clarify this issue.

Besides the open question as to the nature of the mechanisms underlying level 1 VPT and the gaze cueing phenomena, there is a puzzling difference in the empirical evidence reported by these two strands of research: the sensitivity to what someone else is looking at (even when this should be ignored) is much bigger and robust in the context of the VPT paradigm than in the context of the gaze cueing paradigm. This bigger sensitivity is demonstrated by the fact that, when the gazer faces the location opposite to the target, participants’ reaction times (RTs) are delayed by 16 ms (*M* = 394 vs. 410 ms) in the gaze cueing paradigm (an average calculated based on the 28 studies reviewed by Lachat, Conty, Hugueville, & George, 2012) whereas the delay is three times that (47-64 ms; *M* = 592 vs. 645 ms) in the VPT paradigm (McCleery et al., 2011; Samson et al., 2010; Santiesteban et al., 2013). The higher robustness is demonstrated by the fact that in the VPT paradigm the influence of what the other person is looking at is found when the gazing avatar is presented simultaneously with the object(s) to be processed, while in the gaze cueing paradigm, the influence of what the other person is looking at is only found when the gaze cue is presented between 50 and 800 ms prior to the object (Frischen, Bayliss, & Tipper, 2007) but not when the gaze cue is presented simultaneously with the object (i.e., with a

Stimulus-Onset Asynchrony (SOA) of 0 ms ; Xu, Tanaka, & Mineault, 2012). In other words, in the gaze cueing paradigm (unlike in the VPT paradigm), the gazer has to be presented first alone without the competition of other objects to capture attention. This suggests that the priority the attentional system given to the gazer is higher in the VPT paradigm than in the classic gaze cueing paradigm. Understanding the origin of this difference may shed light on the conditions that trigger our sensitivity to what someone else is looking at. This is the aim of the current study.

A closer examination of the discrepant features across the VPT and classic gaze cueing paradigms highlighted three elements that could play a causal role in yielding bigger and more robust sensitivity to what someone else is looking at in the VPT compared to the gaze cuing paradigm.

The first discrepant element is related to the nature of the stimuli used in the two paradigms. Visual salience (e.g. luminance contrast) is known to influence the bottom-up processes that capture our attention to certain features of the scene (Treisman & Gelade, 1980). The absolute visual salience of the gazer as well as its relative salience compared to other elements in the scene may thus have an impact on the extent to which attention is captured by the gazer and what he is looking at. The stimuli of the VPT paradigm are quite different to the ones that are classically used in the gaze cueing paradigm in that the avatar contrasts sharply in terms of luminance (i.e. dark hair and black shirt) with the rest of the scene (i.e. bright blue walls and bright red discs pinned on the wall). It is thus possible that the visual appearance of the stimuli of the VPT paradigm were more optimal to orient attention to the gazer and then to what he is looking at. The visual salience of the directional information of the gazer is another factor that may boost our sensitivity to what another person is looking at. Accordingly, the directional information of the gaze is found to be more salient when several directional cues are oriented in the same direction than in opposite directions (Langton, Watt, & Bruce, 2000; Langton, 2000; but see Hietanen, 1999, 2002; Pomianowska, Germeys, Verfaillie, & Newell, 2011). The stimuli of the VPT paradigm distinguish themselves from the ones used in the classic gaze cueing paradigm in that the directional information is conveyed by a full body avatar whose head and body are congruently oriented sideways at 90° angle. This congruent combination of directional information may increase the salience of the directional information and thus our sensitivity to another person’s direction of gaze.

The second element is the overall level of task complexity across both paradigms. The overall reaction times for participants to judge their own perspective in the VPT paradigm are about 100 to 300 ms longer than the overall reaction times to detect or identify the target in the classic gaze cueing paradigm (Frischen et al., 2007). The longer processing time in the VPT paradigm may provide critical extra time for computing the gaze direction of the avatar and prioritizing attention to what the other person is looking at.

Finally, the third element relates to the differing task instructions across the two paradigms. Task instructions are known to influence how attention is deployed on the task stimuli (Posner, 1980). In the gaze cueing paradigm, participants are asked to detect or identify an object. Thus, the task instructions do not direct attention to the gazer but to the surrounding objects. In the VPT paradigm, participants are asked to judge what they see. Even though this instruction does not directly direct the participants' attention to the gazer and should also direct attention to the surrounding objects, it has been consistently shown that the mere fact of asking participants to focus on their own perspective naturally directs attention to the other person because they construe their perspective as distinct from the other person's perspective (Gendolla & Wicklund, 2009; Hass, 1984; Scaffidi Abbate, Isgró, Wicklund, & Boca, 2006; Stephenson & Wicklund, 1983, 1984).

In a series of three experiments, we examined whether each of these elements plays a causal role in boosting the sensitivity to what someone else is looking at. The boosted sensitivity to what someone else is looking at was here operationalized as the presence of an effect of gaze direction at an SOA of 0 ms, indicating a higher priority given to the gazer and what he is looking at compared to any other stimulus presented simultaneously. Experiment 1 tested for the role of visual salience (luminance contrast and directional information) by using the same stimuli as the ones used in the VPT paradigm by Samson et al. (2010) in a gaze cueing paradigm. Experiment 2 examined the role of task complexity by equating the overall accuracy and response times across the VPT and the gaze cueing paradigms. Finally, Experiment 3 examined the effects of task instructions by equating the attentional deployment onto the gazer across the VPT and the gaze cueing paradigms. All 3 experiments were approved by the ethics committee of the Psychological Sciences Research Institute of the Université catholique de Louvain.

2. Experiment 1

Experiment 1 aimed to test the hypothesis that the stimuli used in the VPT paradigm (Samson et al., 2010) were more optimal to attract attention to the gazer and what he is looking at than the stimuli classically used in the gaze cueing paradigm (e.g., Driver et al., 1999; Friesen & Kingstone, 1998: Hietanen, 1999) in term of visual salience (i.e., luminance contrast, and directional information). In order to test this hypothesis, we developed a gaze cueing task with the visual stimuli of the VPT task. We also manipulated the onset of the target relative to the presentation of the gaze cue with, on half of the trials, the target objects appearing simultaneously with the gaze cue (SOA = 0 ms) and, on the other half of the trials, the target objects appearing 300 ms after the gaze cue. We expect to replicate in the 300-ms SOA condition the findings that participants will be faster to process the targets when these appear in a location congruent with the location the gazer is looking at compared to when the targets appear at the opposite location (e.g., Driver et al., 1999; Friesen & Kingstone, 1998a; Friesen, Moore, & Kingstone, 2005). Furthermore, if the visual appearance of the stimuli of the VPT task is what explains the higher sensitivity to what another person is looking at in the VPT paradigm, we should also find in our modified gaze cueing task a gaze congruency effect in the 0-ms SOA condition.

2.1 Method

2.1.1 Participants

Twenty-six healthy individuals with normal or corrected-to-normal vision participated in the experiment in return of 5 euros (21 females, mean age: 24.22, age range: 18-31).

2.1.2 Apparatus.

Stimuli were presented on a 17-inch monitor (1024x768, 85 Hz, Dell M782p) with the E-prime software (Psychology Software Tools, Pittsburgh, PA, USA) running on a Dell Pentium 4 (2.8 GHz) computer. Participants sat at a distance of approximately 40 cm from the screen.

2.1.3 Stimuli and procedure.

For each trial, participants saw first a fixation cross displayed for 750 ms followed by a 500-ms blank. They then saw a scene (19° x 11.5°) with an avatar (the gazer: 1.5° x 8°) positioned in the centre of a blue room. The avatar was always gender congruent with the participants' gender. The avatar faced either the left or the right wall (see Figure 1). One or two red discs (the target object(s); 0.7° x 1.5° each, 1:1 probability) were presented on one of the lateral walls at 6.5° from the gazer. Participants were instructed to press "1" or "2" on the numerical keypad when respectively 1 or 2 red discs were pinned on the wall. Directly following the participant's response, a feedback "Correct", "Incorrect", or "No response" was presented for 1 s. A "No response" feedback was presented after 2 s had elapsed without a response from the participant.

On half of the trials, the discs were displayed simultaneously with the gazer and the background walls (0-ms SOA condition) whereas in the other half of the trials the red disc(s) appeared 300 ms after the presentation of the gazer and the background walls (300-ms SOA condition). Furthermore, on half of the trials, the discs were presented in the location the gazer was looking at (congruent gaze condition) whereas on the other half of the trials, the discs appeared on the opposite wall (incongruent gaze condition). Forty-eight trials were presented in each of the four conditions that resulted from this 2 (SOA) x 2 (Congruency) design. The trials were presented in random order across 2 blocks of 96 trials preceded by a 32 trials practice block. The task lasted approximately 12 minutes.

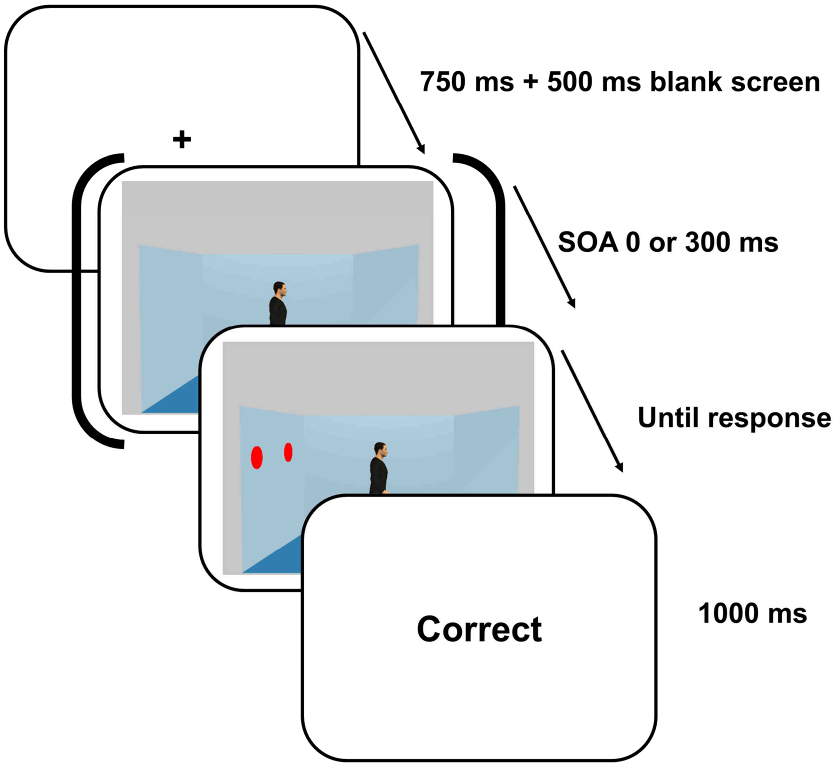


Figure 1. Illustration of the timing of the events on each trial of the gaze cueing task of Experiment 1. On this trial, participants had to press on the key “2” because two discs were visible in the room. The last screen displayed the feedback about participant’s accuracy of response.

2.2 Result

One participant’s overall accuracy was 3 *SD* below the mean accuracy of the group and was thus removed from the analyses.

2.2.1 Reaction times.

Erroneous responses (1.36% of the data) and response omissions due to the timeout procedure (0.02% of the data) were eliminated from the data set when computing the RTs.

A 2 (Congruency) x 2 (SOA) ANOVA was conducted on median RTs. The ANOVA revealed a significant main effect of Congruency, F (1, 24) = 13.838, MSE = 2,116, p = .001, η_p^2 = .366, with slower performances in incongruent trials than in congruent trials, a significant main effect of SOA, F (1, 24) = 480.578, MSE = 118,198, p < .001, η_p^2 = .952, with slower performances in the 0-ms SOA condition than in the 300-ms SOA condition, and a significant Congruency x SOA interaction effect, F (1, 24) = 22.564, MSE = 3,080, p < .001, η_p^2 = .485.

As we were specifically interested in measuring the participants' sensitivity to what a gazer is looking at, we computed a gaze congruency index by subtracting the mean RT on congruent gaze trials from the mean RT on incongruent trials. The gaze congruency index was not different from 0 in the 0-ms condition, t (24) < 1, p = .519, but significantly different from 0 in the 300-ms SOA condition, t (24) = 5.288, p < .001 (see Figure 2).

2.2.2 Error rates.

Response omissions due to the timeout procedure (> 2000 ms) were counted as errors. A 2 (Congruency) x 2 (SOA) ANOVA was conducted on error rates. The ANOVA revealed no significant effect (all *F*s < 1, all *p*s > .425; see Figure 2).

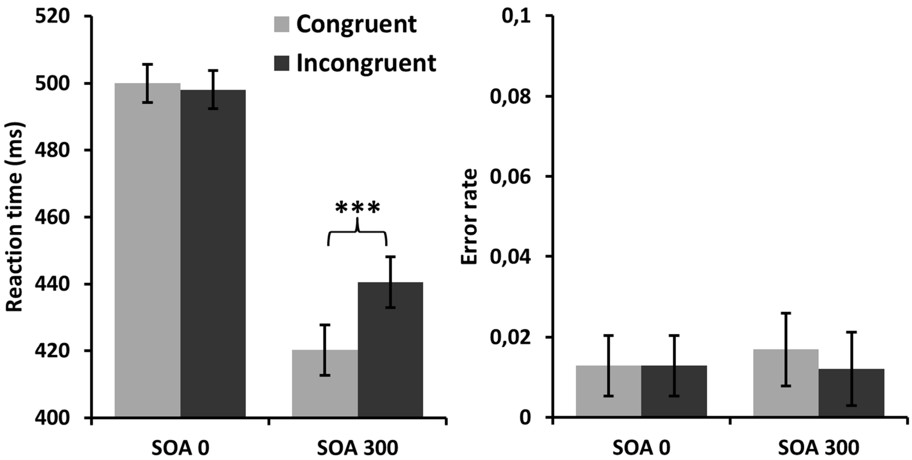


Figure 2. Mean RTs (left panel) and ERs (right panel) in the gaze cueing task of Experiment 1 as a function of SOA (0-ms vs. 300-ms). Error bars represent 95% confidence intervals for pairwise comparisons. *** = p < .001.

These results replicate previous findings (e.g., Driver et al. 1999; Friesen, Moore, & Kingstone, 2005; Friesen & Kingstone, 1998) indicating that participants were sensitive to what a gazer is looking at and showed a gaze cueing effect when using an SOA of 300 ms. Most importantly, despite the fact that we used the visual stimuli proper to the VPT task, we found no evidence of gaze cueing at an SOA of 0 ms. The nature of the stimuli used in the VPT task is thus not what boosts the sensitivity to what another person is looking at.

3. Experiment 2

Experiment 2 aimed to test the hypothesis that the task complexity of the VPT task allows for extra time for the influence of the gazing avatar to start and modulate the task performance. In order to test this hypothesis, we developed a gaze cueing task and VPT task that were matched in terms of working memory load and task difficulty and hence overall response time. We also ensured that the stimuli used in the VPT and the gaze cueing tasks were matched in terms of visual appearance. Furthermore, like in Experiment 1, we manipulated the SOA (0 ms versus 300 ms). We expected to find in the VPT task a sensitivity to what another person is looking at irrespective of the SOA (although the VPT had never been implemented before with an SOA of 300 ms). We also expected to replicate this sensitivity in the gaze cueing paradigm at an SOA of 300 ms but the critical question was whether this sensitivity would now also be found at an SOA of 0 ms. If the increased task complexity of the novel gaze cueing task delays participants' responses and through this gives a better opportunity for attention to be attracted to the gazer and what he is looking at, then we should find a significant sensitivity to what a gazer is looking at with an SOA of 0 ms in the gaze cueing task.

3.1 Method

3.1.1 Participants.

52 healthy individuals with normal or corrected-to-normal vision participated in the experiment in return of 8 euros and were randomly allocated to either the gaze cueing task condition (17 females, mean age: 21.50, age range: 18-30) or the VPT task condition (17 females, mean age: 21.57, age range: 18-28) with a total of 26 participants in each condition.

3.1.2 Apparatus.

Identical to Experiment 1.

3.1.3 Stimuli and procedure.

The gaze cueing task.

Participants were presented with similar room displays as the ones used in Experiment 1. The room included one centrally positioned avatar facing either the left or the right wall and no discs[1] on the walls or one to two discs pinned on one of the walls. There were two main changes to the task (see Figure 2). (A series of pilot tests indicated that these were efficient ways to match the overall response times and task complexity across the gaze cueing and VPT tasks). Firstly, the discs were not red anymore but were black with a fine red or green contour. Secondly, the participants were asked to verify whether two prompts presented before the room was displayed matched the content of the room. The sequence of events within a trial closely matched the sequence of events in the classic VPT task (Samson et al., 2010). More specifically, participants were first shown a colour prompt for 750 ms indicating which discs they had to take into account ("RED" meant that participants should only take into account the black discs with a red contour while "GREEN" meant that they had to take into account the black discs with a green contour). After a 500-ms blank screen, participants were presented with a number prompt (ranging from 0 to 2) for 750 ms.

[1] The trials without disc were used as catch trials.

After a 500-ms blank screen, the room was displayed and the participants were asked to indicate whether the number prompt matched the number of discs with the prompted colour contour displayed in the room by pressing the upward arrow (yes) or downward arrow key (no). For example, following the prompts “RED” and “2”, participants had to say whether there were two black discs with a red contour in the room or not (“yes” or “no”). A 50-ms auditory signal was displayed informing when participants could respond. This feature was added to prevent participants from confusing trials from the 0-ms SOA condition with no disc in the room with trials from the 300 ms SOA condition (in which the appearance of the discs is delayed). Directly following the participant’s response, a feedback “Correct”, “Incorrect”, or “No response” was presented for 1 s. A “No response” feedback was presented after 2 s had elapsed without a response from the participant.

On one half of the trials, the black disc(s) were displayed simultaneously with the gazer and the background walls (0-ms SOA condition) whereas on the other half of the trials the black disc(s) appeared 300 ms after the presentation of the scene (300-ms SOA condition). Furthermore, on half of the trials, the target discs appeared at the location gazed at (congruent gaze condition) whereas on the other half of the trials, the discs appeared on the opposite wall (incongruent gaze condition). There were 32 matching trials and 32 mismatching trials in each of the 4 experimental conditions (2 (SOA) x 2 (Congruency)). The two types of colour prompts (“RED” or “GREEN”) were equally distributed across all experimental conditions. As in the original VPT paradigm, mismatching trials were discarded from the analysis due to concerns that they may artificially inflate the gaze congruency effect (the number prompts in the mismatching trials of the congruent gaze condition do not correspond to either the number of red, green or total number of discs and are thus particularly easy to reject). In addition, 64 filler trials with no disc or with discs on the two lateral walls were added to balance the occurrences of each number prompt (0, 1, or 2) across conditions; these filler trials were removed from the analyses. The trials were presented in random order across 4 blocks of 80 trials preceded by a 40 trials practice block. The task lasted approximately 32 minutes.

The VPT task.

The VPT task was identical to the gaze cueing task except that the colour prompt was replaced by a perspective prompt indicating which perspective participants had to judge (“YOU” or “SHE”/“HE”). Participants had hence to judge whether the number prompt matched the number of discs that either they themselves (critical self-perspective trials) or the avatar (filler other-perspective trials)[2] could see (see Figure 3). The colour of the disc contours varied as in the gaze cueing task but was not relevant for the VPT task. The gaze

[2] Filler other-perspective trials are included to ensure that participants maintain a perspective-taking mind-set. If only self-perspective-taking trials are included, participants after a certain time risk to construe the task more like in the gaze cueing task (counting the dots) rather than as a perspective-taking task (what do “I” see).

congruent condition corresponded to trials where participants had to judge their own perspective (“YOU” prompts) and where the discs appeared in the line of sight of the avatar. The gaze incongruent condition corresponded to trials where participants had to judge their own perspective (“YOU” prompts) and where the discs appeared on the opposite wall to the one the avatar was gazing at. The design (2 (SOA) x 2 (Congruency)) was identical to the gaze cueing task, including in terms of the number of matching, mismatching, and filler trials, which were identically distributed across the 4 experimental conditions. The two types of perspective prompts (“YOU” or “HE”/“SHE”) were equally distributed across all experimental conditions. The task lasted approximately 32 minutes.

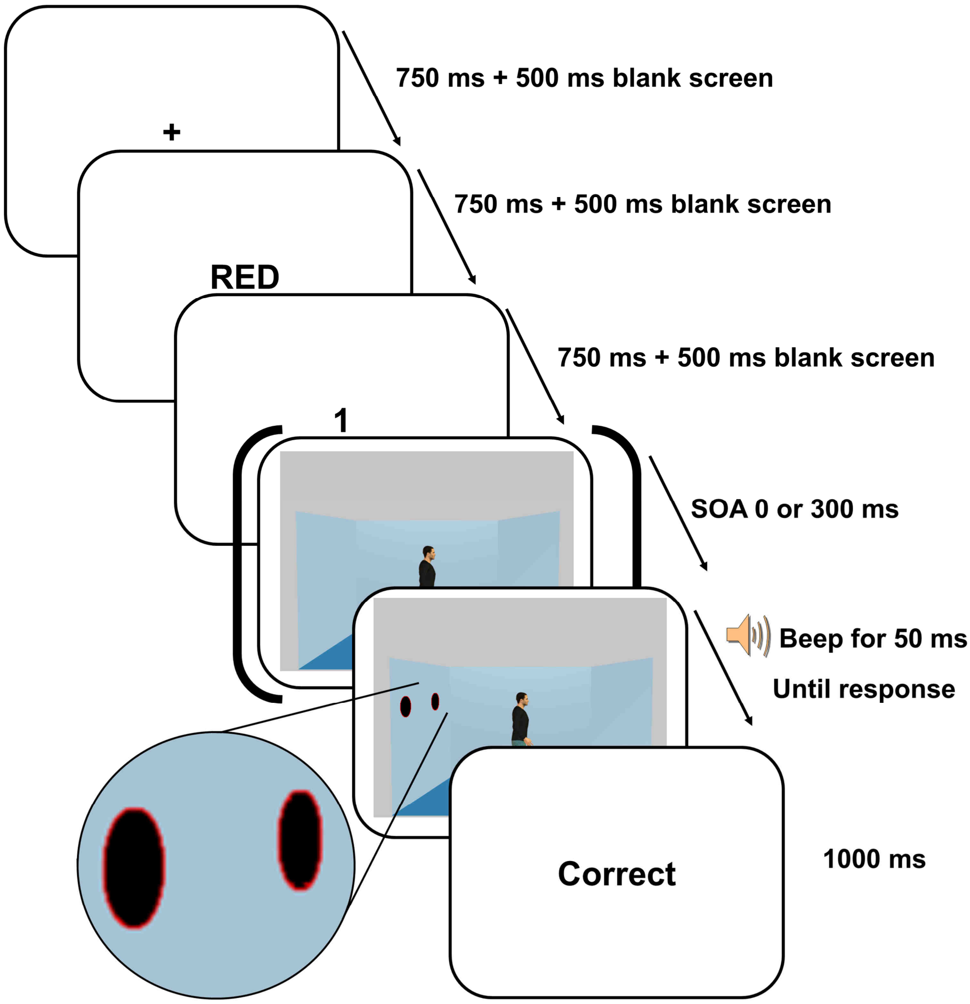


Figure 3. Illustration of the timing of the events on each trial of the gaze cueing task of Experiment 2. On this trial, participants had to judge whether there was one disc with a red border (see magnified view of the discs used) visible in the room. The last screen displayed the feedback about participant’s accuracy of response.

3.2 Result

3.2.1 The VPT task.

One participant's overall accuracy was 3 *SD* below the mean accuracy of the group and was thus removed from analyses. As a reminder, only self-perspective trials were taken into account as these are the trials where computing what the avatar sees is task-irrelevant. The results of the full analysis of the VPT task replicate the original task (Samson et al., 2010) and are reported in Appendix 1.

Reaction times.

Erroneous responses (3.19% of the data) and response omissions due to the timeout procedure (0.24% of the data) were eliminated from the data set when computing the median RTs.

A 2 (Congruency) x 2 (SOA) ANOVA was conducted on median RTs. The ANOVA revealed a significant main effect of Congruency, F (1, 24) = 15.995, *MSE* = 39,204, p = .001, η_p^2 = .204, with slower performances in incongruent trials than in congruent trials, a significant main effect of SOA, F (1, 24) = 41.204, *MSE* = 207,025, p < .001, η_p^2 = .632, with slower performances in the 0-ms SOA condition than in the 300-ms SOA condition, and a non-significant Congruency x SOA interaction effect, F (1, 24) = 1.222, *MSE* = 3,147, p = .280, η_p^2 = .048.

Similarly to the analyses conducted in Experiment 1, we computed a gaze congruency index by subtracting the mean RT on congruent trials from that on incongruent trials. The gaze congruency index was significantly different from 0 both in the 0-ms and the 300-ms SOA conditions, t (24) = 3.284, p = .003, t (24) = 2.226, p = .036, respectively (see Figure 4).

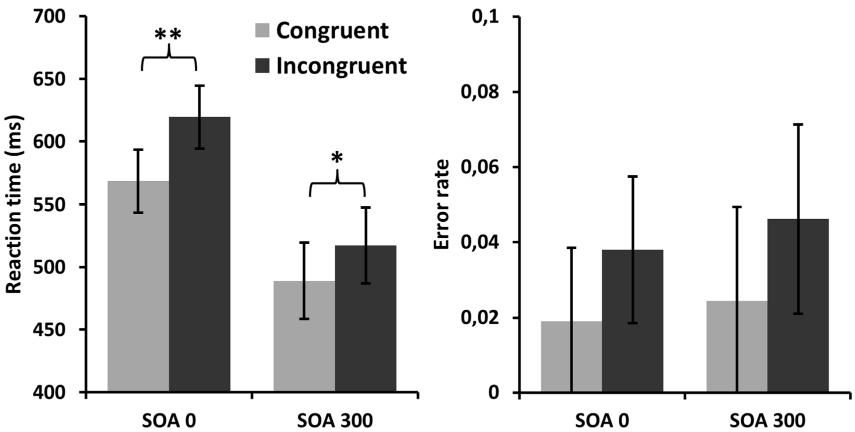


Figure 4. Mean RTs (left panel) and ERs (right panel) in the visual perspective-taking task of Experiment 2 as a function of SOA (0-ms vs. 300-ms). Error bars represent 95% confidence intervals for pairwise comparisons. * = p < .05, ** = p < .01.

Error rates.

Response omissions due to the timeout procedure (> 2000 ms) were counted as errors. Two participants' congruency indexes were 3 *SD* higher than the mean congruency index of the group; these participants were thus removed from analyses.

A 2 (Congruency) x 2 (SOA) ANOVA was conducted on ERs. The ANOVA revealed a significant main effect of Congruency, F (1, 22) = 6.894, MSE = .010, p = .015, η_p^2 = .239, with lower performances in incongruent trials than in congruent trials, a non-significant main effect of SOA, F (1, 22) < 1, MSE = .001, p = .580, η_p^2 = .014, and a non-significant Congruency x SOA interaction effect, F (1, 22) < 1, MSE = .001, p = .874, η_p^2 = .001.

Similarly to the analyses conducted in Experiment 1, we computed a gaze congruency index by subtracting the mean ER in congruent trials from that in incongruent trials. The gaze congruency index was close to significantly different from 0 both in the 0-ms and the 300-ms SOA conditions, t (22) = 1.908, p = .069, t (22) = 1.699, p = .103, respectively (see Figure 4).

These results replicate that, in the VPT task, we are sensitive to what a gazer is looking at an SOA of 0 ms and, in addition, shows for the first time that this effect is maintained when the SOA is increased to 300 ms.

3.2.2 The gaze cueing task.

One participant's overall accuracy was 3 *SD* below the mean accuracy of the group.

Reaction times.

Erroneous responses (0.74% of the data) and response omissions due to the timeout procedure (0.09% of the data) were eliminated from the data set when computing the median RTs. Two participants' congruency indexes were 3 *SD* higher than the mean congruency index of the group and were thus removed from analyses.

A 2 (Congruency) x 2 (SOA) ANOVA was conducted on median RTs. The ANOVA revealed a significant main effect of Congruency, F (1, 22) = 5.621, MSE = 3,537, p = .027, η_p^2 = .204, with slower performances in incongruent trials than in congruent trials, a significant main effect of SOA, F (1, 22) = 76.351, MSE = 61,906, p < .001, η_p^2 = .776, with slower performances in the 0-ms SOA condition than in the 300-ms condition, and a significant Congruency x SOA interaction effect, F (1, 22) = 10.404, MSE = 4,375, p = .004, η_p^2 = .321.

Similarly to the analyses conducted in Experiment 1, we computed a gaze congruency index by subtracting the mean RT on congruent trials from that on incongruent trials. The gaze congruency index was not different from 0 in the 0-ms condition, t (22) < 1, p = .833, but significantly different from 0 in the 300-ms SOA condition, t (22) = 3.751, p = .001 (see Figure 5).

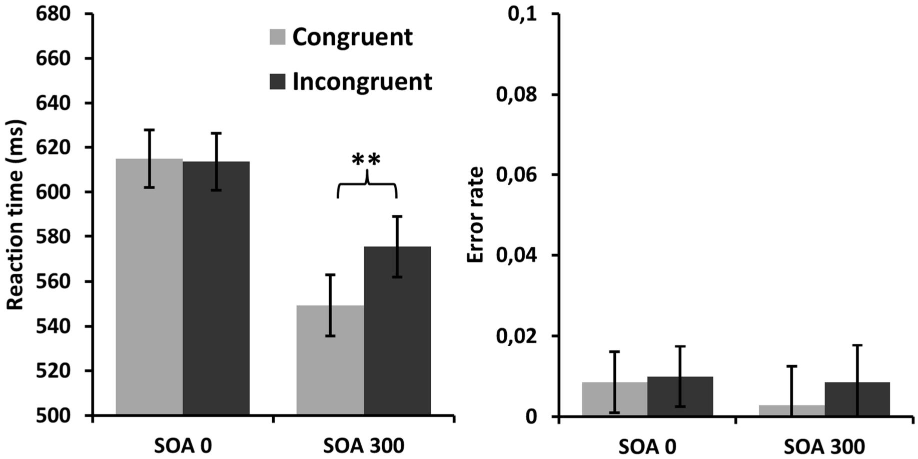


Figure 5. Mean RTs (left panel) and ERs (right panel) in the gaze cueing task of Experiment 2 as a function of SOA (0-ms vs. 300-ms). Error bars represent 95% confidence intervals for pairwise comparisons. ** = $p < .01$.

Error rates.

Response omissions due to the timeout procedure (> 2000 ms) were counted as errors. One participant's overall accuracy was 3 *SD* below the mean accuracy of the group and three participants' congruency index were 3 *SD* higher than the mean congruency index of the group; these participants were thus removed from analyses.

A 2 (Congruency) x 2 (SOA) ANOVA was conducted on ERs. The ANOVA revealed no significant effect (all *F*s < 1.337, all *p*s > .260; see Figure 5).

3.2.3 Tasks comparison.

In order to verify that the gaze cueing and VPT tasks were matched in terms of task difficulty we compared the overall performance between the two tasks on RTs and ER. Participants' responses were slower but more often accurate in the gaze cueing task than in the VPT task, t (48) = 1.635, $p = .108$, t (48) = 4.369, $p < .001$, respectively. Because there was a clear difference in the speed-accuracy trade-off between the two tasks and because the mean ERs of both tasks were below .10, we performed the same comparison on the inverse efficiency scores (IES), which combines the two measures of performance (formula: IES = RT/(1-ER)). The overall IES performance in the gaze cueing task (M = 614) was not significantly different from the overall performance in the VPT task (M = 578), t (48) < 1, $p = .334$.

In sum, our results replicate the findings that, in the gaze cueing task, participants are sensitive to what another person is looking at and showed a gaze-cuing effect with an SOA of 300 ms (e.g., Driver et al. 1999; Friesen, et al., 2005; Friesen & Kingstone, 1998) despite the unusual increase in working memory load and overall task difficulty. Importantly, however, there was no sensitivity to what the gazer was looking at with an SOA of 0 ms.

Consequently, the hypothesis according to which the task complexity or the working memory load of the VPT task allows more time for our sensitivity to another person's gaze to emerge is not supported.

4. Experiment 3

Experiment 3 aimed to test the hypothesis that the different task instructions across the classic gaze cueing paradigm and the VPT paradigm lead to a different top-down attentional deployment on the scene. Through the perspective-taking instructions of the VPT task, attention would be deployed on the scene in such a way that it encompasses the gazer (and hence what he is looking at) even when participants judge their own perspective. Several studies suggest that this may result from the fact that perspective taking is about differentiating the self from another and that even when we think about the self, attention is naturally drawn to the other (e.g., Abbate et al., 2006; Gendolla & Wicklund, 2009; Hass, 1984; Stephenson & Wicklund, 1983). In contrast, the instructions of a classic gaze cueing task only draw attention to the objects present in a scene. In order to test this hypothesis, we modified the gaze cueing task so that attention is artificially drawn to the location of the avatar (importantly however, without explicitly asking to pay attention to the avatar). This was achieved by superimposing the instruction prompts on the avatar. We again manipulated the SOA (0 versus 300 ms) and closely matched all the trial events across the gaze cueing and the VPT tasks. We expected to replicate the sensitivity to what another person is looking at in the VPT task irrespectively of the SOA; we also expected to find this sensitivity in the gaze cueing task when the SOA is 300 ms and the crucial question is whether our task modifications are sufficient to now find this sensitivity also at an SOA of 0 ms.

4.1 Method

4.1.1 Participants.

Fifty healthy individuals with normal or corrected-to-normal vision participated in the experiment in return of 8 euros and were randomly allocated between the gaze cueing task condition (19 females, mean age: 21.70, age range: 18-28) and VPT task condition (19 females, mean age: 22.10, age range: 18-30) with a total of 25 participants in each condition.

4.1.2 Apparatus.

Identical to Experiment 1.

4.1.3 Stimuli and procedure.

The gaze cueing task.

Participants were presented with the same stimuli and instructions as in Experiment 2 except for four changes made to the task. Firstly, the discs were not black with a red or green contour but were fully coloured in red or green (see Figure 3). Secondly, the colour and number prompts were not presented before the room was displayed but were presented simultaneously with the room, superimposed on the avatar's chest. This was done to force attention to be deployed on the avatar (without referring to perspective taking, however). Thirdly, the "GREEN" colour prompt was changed to "ALL" and meant that participants had to take into account all colours of discs. For example, participants were shown the room, read "ALL 2" on the avatar's chest, and thus had to say whether there were two discs in the room or not, no matter their colour. This change was made to match more closely the effects of the perspective prompts on attention deployment ("ALL" matching the "SELF" prompt by encompassing all discs and "RED" matching the "SHE"/"HE" prompt by encompassing sometimes only a subset of discs). Fourthly, the discs displayed on the same wall were either all red or all green to reduce the cognitive demand of selective attention in the "RED" colour instruction condition (otherwise, the green disc would have been a nearby, and thus potent, distractor).

The design (2 (SOA: 0 vs. 300 ms) x 2 (Congruency: congruent vs. incongruent gaze)) was identical to Experiment 2, including in terms of the number of matching, mismatching, and filler trials, which were identically distributed across the 4 experimental conditions. The two types of colour prompts ("RED" or "ALL") were equally distributed across all experimental conditions. The task lasted approximately 22 minutes and contained 4 blocks of 80 trials preceded by a practice block of 24 trials.

The VPT task.

Participants were presented with same stimuli as the gaze cueing task of this experiment but with the prompts of the VPT task of Experiment 2. For example, participants were shown the room, read "YOU 2" on the avatar's chest, and thus had to say whether they could see from their own perspective two discs in the room or not.

The design (2 (SOA: 0 vs. 300 ms) x 2 (Congruency: congruent vs. incongruent gaze)) was identical to Experiment 2, including in terms of the number of matching, mismatching, and filler trials, which were identically distributed across the 4 experimental conditions. The two types of perspective prompts ("YOU" or "SHE"/"HE") were equally distributed across all experimental conditions. The task lasted approximately 22 minutes and contained 4 blocks of 80 trials preceded by a practice block of 24 trials.

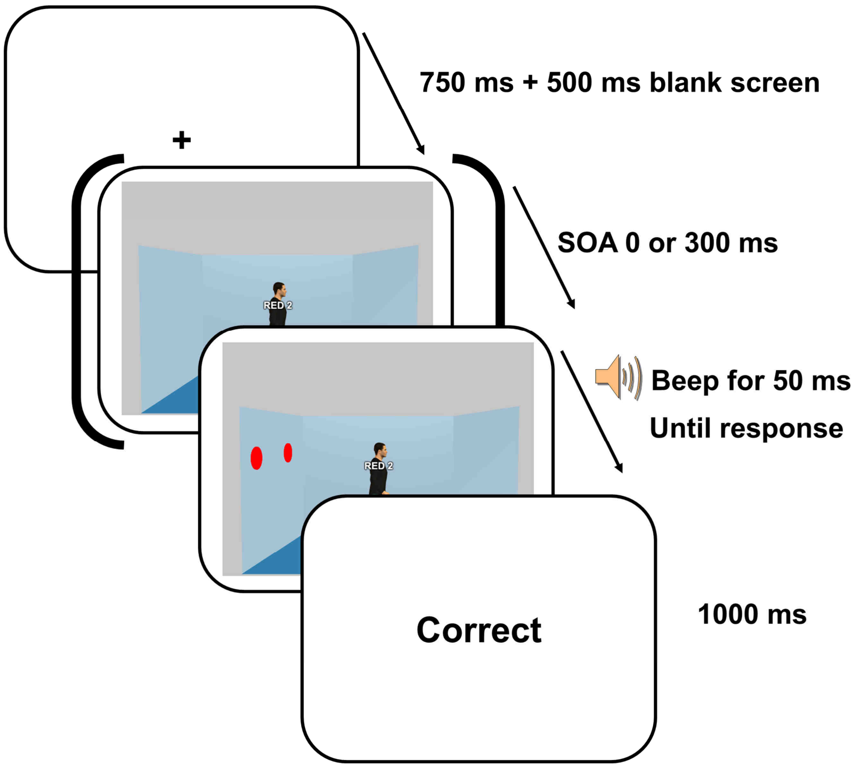


Figure 6. Illustration of the timing of the events on each trial of the gaze cueing task of Experiment 3. On this trial, participants had to judge whether there were two red discs visible in the room. The last screen displayed the feedback about participant's accuracy of response.

4.2 Result

4.2.1 The VPT task.

As a reminder, only self-perspective trials were taken into account as these are the trials where computing what the avatar sees is task-irrelevant. The results of the full analysis of the VPT task replicate the original task (Samson et al., 2010) and are reported in Appendix 1.

Reaction times.

Erroneous responses (5.25% of the data) and response omissions due to the timeout procedure (0.03% of the data) were eliminated from the data set when computing the median RTs.

A 2 (Congruency) x 2 (SOA) ANOVA was conducted on median RTs. The ANOVA revealed a significant main effect of Congruency, F (1, 24) = 54.716, MSE = 309,136, p < .001, η_p^2 = .695, with slower responses in incongruent trials than in congruent trials, a significant main effect of SOA, F (1, 24) = 205.559, MSE = 1,255,296, p < .001, η_p^2 = .895, with slower responses in the 0-ms SOA condition than in the 300-ms condition, and a significant Congruency x SOA interaction effect, F (1, 24) = 8.603, MSE = 23,286, p = .007, η_p^2 = .264.

Similarly to the analyses conducted in Experiment 1 and 2, we computed a gaze congruency index by subtracting the mean RT on congruent trials from that on incongruent trials. The gaze congruency index was significantly different from 0 both in the 0-ms and the 300-ms SOA conditions, t (24) = 7.949, p < .001, t (24) = 4.308, p < .001, respectively (see Figure 7). Moreover, the gaze congruency index was significantly higher in the 0-ms SOA condition than in the 300-ms SOA condition, t (24) = 2.933, p = .007.

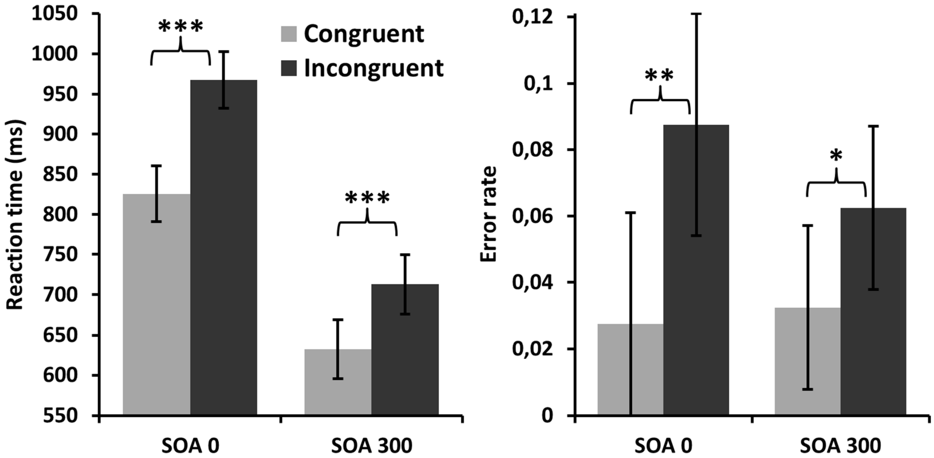


Figure 7. Mean RTs (left panel) and ERs (right panel) in the visual perspective-taking task of Experiment 3 as a function of SOA (0-ms vs. 300-ms). Error bars represent 95% confidence intervals for pairwise comparisons. * = p < .05, ** = p < .01, *** = p < .001.

Error rates.

Response omissions due to the timeout procedure (> 2000 ms) were counted as errors. A 2 (Congruency) x 2 (SOA) ANOVA was conducted on ERs. The ANOVA revealed a significant main effect of Congruency, F (1, 24) = 14.113, MSE = .051, p = .001, η_p^2 = .370, with lower performances in incongruent trials than in congruent trials, a non-significant main effect of SOA, F (1, 24) < 1, MSE = .002, p = .484, η_p^2 = .021, and a non-significant Congruency x SOA interaction effect, F (1, 24) = 2.752, MSE = .006, p = .110, η_p^2 = .103.

Similarly to the analyses conducted on RTs, we computed a gaze congruency index by subtracting the mean ER on congruent trials from that on incongruent trials. The gaze congruency index was close to significantly different from 0 both in the 0-ms and the 300-ms SOA conditions, t (24) = 3.507, p = .002, t (24) = 2.388, p = .025, respectively (see Figure 7).

Ins sum, these results replicate the findings that participants are sensitive to what a gazer is looking at both at an SOA of 0 ms and 300 ms but, in addition, these results show that this sensitivity is stronger at an SOA of 0 ms than at an SOA of 300 ms (see Figure 9).

4.2.2 The gaze cueing task.

Trials with the red colour instruction when only green discs were presented (i.e., 25% of all trials) were removed from the analyses because it was too difficult to press “yes” when zero red disc was presented (accuracy was 3 *SD* below the mean overall accuracy level).

Reaction times.

Erroneous responses (2.09% of the data) and response omissions due to the timeout procedure (0.02% of the data) were eliminated from the data set when computing the median RTs.

A 2 (Congruency) x 2 (SOA) ANOVA was conducted on median RTs. The ANOVA revealed a significant main effect of Congruency, F (1, 24) = 23.471, MSE = 21,550, p < .001, η_p^2 = .494, with slower performances in incongruent trials than in congruent trials, a significant main effect of SOA, F (1, 24) = 519.219, MSE = 1,012,639, p < .001, η_p^2 = .956, with slower performances in the 0-ms SOA condition than in the 300-ms condition, and a non-significant Congruency x SOA interaction effect, F (1, 24) = 1.037, MSE = 1,697, p = .319, η_p^2 = .041.

Similarly to the analyses conducted in Experiment 1 and 2, we computed a gaze congruency index by subtracting the mean RT on congruent trials from that on incongruent trials. The gaze congruency index was significantly different from 0 both in the 0-ms and the 300-ms SOA conditions, t (24) = 3.704, p = .001, t (24) = 2.097, p = .047, respectively (see Figure 8).

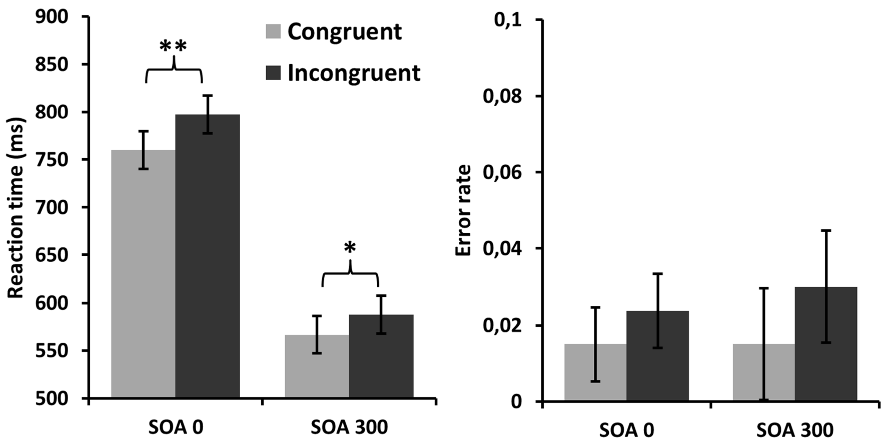


Figure 8. Mean RTs (left panel) and ERs (right panel) in the gaze cueing task of Experiment 3 as a function of SOA (0-ms vs. 300-ms). Error bars represent 95% confidence intervals for pairwise comparisons. * = p < .05, ** = p < .01.

Error rates.

Response omissions due to the timeout procedure (> 2000 ms) were counted as errors. A 2 (Congruency) x 2 (SOA) ANOVA was conducted on ERs. The ANOVA revealed a significant main effect of Congruency, F (1, 24) = 11.340, MSE = .004, p = .003, η_p^2 = .321, with lower performances in incongruent trials than in congruent trials, a non-significant main effect of SOA, F (1, 24) < 1, MSE = .001, p = .579, η_p^2 = .013, and a non-significant Congruency x SOA interaction effect, F (1, 24) < 1, MSE = .001, p = .558, η_p^2 = .014.

Similarly to the analyses conducted on RTs, we computed a gaze congruency index by subtracting the mean ER on congruent trials from that on incongruent trials. The gaze congruency index was close to significantly different from 0 both in the 0-ms and the 300-ms SOA conditions, t (24) = 1.769, p = .090, t (24) = 2.009, p = .056, respectively (see Figure 8).

In sum, these results replicate the finding that participants are sensitive to what a gazer is looking at with an SOA of 300 ms (e.g., Driver et al. 1999; Friesen, et al., 2005; Friesen & Kingstone, 1998). Importantly, however, this sensitivity, that is to say the gaze cueing effect, was found for the first time with an SOA of 0 ms. This finding strongly supports the hypothesis that drawing attention to the location of the gazer through task instructions boosts participants' sensitivity to what another person is looking at (see Figure 9).

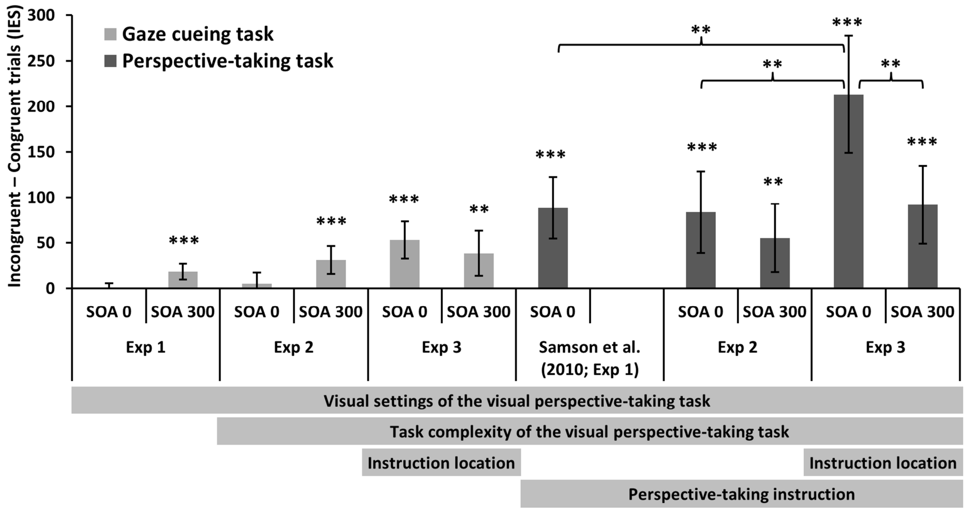


Figure 9. Gaze congruency indexes (Incongruent – Congruent gaze trials subtraction) as a function of Task (gaze cueing vs. perspective taking), Experiment (1, 2, 3), and Stimulus-Onset Asynchrony (SOA: 0-ms vs. 300-ms). For the purpose of between-experiment comparisons and because the mean ER was below .10, indexes were calculated from the inverse efficiency scores (IES; formula: RT/(1-ER)). Error bars indicate the 95% confidence intervals. ** = p < .01, *** = p < .001 (selected comparisons).

5. General discussion

Across 3 experiments in which participants completed a gaze cueing task, our results replicated the well-known finding that participants perform better in identifying a target presented in the line of sight of a gazer than a target presented outside of its line of sight when the gazer is presented 300 ms prior to the target (i.e., with an SOA of 300 ms; Driver et al., 1999; Friesen & Kingstone, 1998). Furthermore, we replicated in Experiments 2 and 3 that, in a VPT paradigm, sensitivity to another person's gaze direction can be observed not only when the gazer is presented prior to the target but even when the gazer is presented simultaneously with the target (i.e., with an SOA of 0 ms; McCleery et al., 2011; Samson et al., 2010; Santiesteban et al., 2013; Surtees & Apperly, 2012). Most importantly, we showed, however, that the presence of a gaze congruency effect at an SOA of 0 ms in the gaze cueing paradigm cannot be systematically found despite that we matched the gaze cueing task in terms of stimuli saliency (Experiment 1) or task difficulty (Experiment 2) with the VPT task. The gaze congruency effect at an SOA of 0 ms was only found in the gaze cueing task when the instructions specifically directed participants' attention to the avatar's location by having a part of the instructions superimposed on the avatar (Experiment 3). Altogether, this pattern of results provides important insights into the conditions in which we process where/what another person is looking at.

On the one hand, our results show that once attention is drawn to a person (even when there is no explicit instruction to take into account that person's visual experience), what is in the line of sight of the person is automatically computed and influences judgments we make about what we ourselves see. This is truly independent of whether participants are placed in a gaze cueing or a VPT task. Importantly, however, our results show that whether attention is drawn to the person in the first place is context-dependent: the social mind-set created by a perspective-taking task (even when participants are only required to judge their own perspective) seems to naturally draw attention to the other person whereas in a gaze cueing task, attention has to be drawn by external factors such as the prior presentation of the gazer alone without competing stimuli (as with the classic 300-ms SOA) or the presentation of task-relevant information in the same location as the avatar (as in Experiment 3). This means that it is not the mere presence of another person in our field of view that triggers attentional orienting or line of sight computation but the mere fact of looking at or attending to another person. This has implications for the question of the automaticity with which we compute what someone else is looking at.

Automaticity is a complex concept in cognitive sciences which is best examined when measurable characteristics are defined (Moors & De Houwer, 2006). Three important characteristics of automaticity that are often examined are the following: (1) whether the process is unintentional (i.e., "*uncontrolled in terms of the goal to engage in the process*", p. 309), (2) whether the process is efficient (or effortless; i.e., "*consumes little or no processing resources or attentional capacity*", p. 317), and (3) whether the process is stimulus driven (i.e., "*produced by the mere presence of the stimulus*", p. 308). Firstly and in relation to the first characteristic, there is evidence that the computation of what someone else is looking at occurs even when it is not necessary to do so for the task and even at the cost of task performance: in both the gaze cueing task and the critical self-perspective trials of the VPT task of this study, participants were not instructed to pay attention to the gazer, the gaze direction was not predictive of the location of the targets, and error feedbacks were given to participants so that they were made aware of the interference they were experiencing. Despite these factors, participants still computed what the gazer was looking at. Note that in our VPT task we did not use the clearest condition to show unintentional processing because the task also included trials in which participants were asked to judge the avatar's perspective and, hence, even if the avatar's perspective was not relevant for the critical self-perspective trials, it was nevertheless relevant at other moments in the task. Importantly, however, previous studies that have used the VPT paradigm have shown that participants compute what the avatar sees even when throughout the whole experience they are only required to judge their own perspective (Samson et al., 2010; Santiesteban et al., 2013). Thus, all together, the results support the notion that participants compute what another person is looking at "unintentionally".

Secondly, it has been shown in previous studies with both the gaze cueing and the VPT paradigms that the computation of what someone else is looking at is not suppressed or down-modulated when participants are in a dual-task situation, supporting the view that the computation is "effortless" (Hayward & Ristic, 2013; Law, Langton, & Logie, 2010; Qureshi et al., 2010).

Finally, regarding the triggering conditions, our results clearly show that the mere presence of the other person is not sufficient to trigger the computation of what that person is looking at. Hence, computing what another person is looking at is not stimulus-driven but context-dependent. Thus, in a situation where a person is surrounded by objects (like a classic gaze cueing task at an SOA of 0 ms), attention is probably distributed across the scene and this does not seem to be sufficient to trigger the computation of what another person is looking at. Instead, attention needs to prioritize the gazing person before the computation of what the gazing person is looking at can happen. The prioritization can be achieved in at least 3 contexts. First, in the context of the VPT task, attention seems to be narrowed down to the gazing person because of its high relevance for the perspective-taking instructions. The high relevance seems to suffice to prioritize the processing of the gazing person over the processing of the competing peripheral target and would explain why there is a gaze congruency effect at an SOA of 0 ms with the VPT task. Second, in the context of the classic gaze cueing paradigm with an SOA of at least 50 ms, attention is narrowed down to the gazing person because it appears first alone without competing objects in the scene, which is why we consistently found a gaze congruency effect at an SOA of 300 ms across all experiments. Third, in the context of goal-relevant information placed on the same location as the gazing person, attention is narrowed down to the area of the gazing person in order to read the instructions. This also seems to be sufficient to prioritize the processing of the gazing person over the competing peripheral target and explains why we found a gaze congruency effect at an SOA of 0 ms with the gaze cueing task in Experiment 3. In sum, the computation of what another person is looking at does not seem to occur when the gazing person and the peripheral target appear simultaneously unless attention is narrowed down to the gazing person through the influence of social or non-social factors.

Interestingly, the mere fact of judging one's own visual perspective is sufficient to trigger the computation of what another person is seeing. Following the seminal finding of Hass (1984), Wicklund and colleagues (Abbate et al., 2006; Gendolla & Wicklund, 2009; Stephenson & Wicklund, 1983, 1984) have repeatedly shown that when we are asked to focus on ourselves, we are more prompt to take another person's perspective. These authors stated that such self-focus exacerbates our awareness of how distinct we are from others and how we are perceived by others, which increases the salience of the other person's perspective (Stephenson & Wicklund, 1983). This latter view is line with the observation that young children who fail to take another person's visual perspective are those who fail to differentiate the self from others (Flavell, Botkin, Fry, Wright, & Jarvis, 1968; Flavell et al., 1981). Altogether, it seems likely that, in the VPT paradigm, when participants are explicitly asked to take their own visual perspective, they are put in a social mind-set that increases the salience of the gazer and thus the amount of attention deployed on it.

Finally, while our study speaks to the question of the conditions that trigger the computation of where/what another person is looking at, our results leave open for future research important follow-up questions. Firstly, when people compute what another is looking at, what exactly do they compute? Do they simply extract directional information or do they infer a mental state ("seeing"), or both? Some studies have started to look into this issue but the results are not yet clear-cut (Santiesteban et al., 2013; Teufel et al., 2010). Secondly, are the factors that trigger the computation of what another person is looking at (VPT1) sufficient to also trigger the computation of how someone else sees a scene (VPT2)? VPT2 is usually seen as a more complex form of perspective taking than VPT1, as it takes longer to develop in children (Masangkay et al., 1974) and relies on different cognitive mechanisms, such as mental body rotation (A. Surtees et al., 2013; A. D. R. Surtees et al., 2013). It is thus possible that VPT1 and VPT2 also differ in terms of their triggering factors.

6. Conclusion

Humans are sensitive to what other people are looking at. This has been evidenced in a gaze cueing paradigm in which participants are less efficient in processing objects when these appear in a location incongruent with the location another person is looking at (e.g., Driver et al., 1999; Friesen & Kingstone, 1998; Friesen et al., 2005; Hietanen, 1999, 2002) and in a VPT task in which participants are less efficient at processing the objects visible from their own visual perspective when these are not visible from someone else's perspective (Qureshi et al., 2010; Samson et al., 2010; Santiesteban et al., 2013; Surtees &

Apperly, 2012). Interestingly, the sensitivity to what the other person is looking at is higher and more robust in the VPT paradigm than the gaze cueing paradigm. We showed that this can be explained by how attention is deployed on the other person in relation to the task-goal and more specifically, that the social mind-set induced by perspective-taking instructions provides a powerful contextual trigger.

7. Appendix 1

7.1 Results at the VPT task in Experiment 2

One participant's overall accuracy was 3 *SD* below the mean accuracy of the group and was thus removed from the analyses.

7.1.1 Reaction times.

The ANOVA 2 (Perspective instruction: self- vs. other-perspective) x 2 (Congruency: congruent vs. incongruent) x SOA (0-ms vs. 300-ms) conducted on the median RTs revealed a significant main effect of Congruency, F (1, 24) = 31.314, *MS*E = 485,752, $p <$ .001, $\eta_p^2 = .566$, with faster responses on congruent perspectives trials than on incongruent perspectives trials, a main effect of Perspective, F (1, 24) = 8.375, *MSE* = 62,994, $p = .008$, $\eta_p^2 = .259$, with participants being faster at judging from their own perspective than the avatar's perspective, a significant main effect of SOA, F (1, 24) = 59.584, *MS*E = 493,173, $p < .001$, $\eta_p^2 = .713$, with faster responses on SOA 300-ms trials than on SOA 0-ms trials, and a significant Congruency x Perspective interaction effect, F (1, 24) = 23.673, *MSE* = 173,843, $p < .001$, $\eta_p^2 = .497$, with a higher effect of Congruency on other-perspective trials than on self-perspective trials and faster and slower responses on other-perspective trials than self-perspectives trials in the congruent and incongruent trials, respectively. Other interactions were not significant (all *p*s > .265). These results replicate the finding of the original study by Samson et al. (2010).

7.1.2 Error rates.

The ANOVA 2 (Perspective instruction: self- vs. other-perspective) x 2 (Congruency: congruent vs. incongruent) x SOA (0-ms vs. 300-ms) conducted on the ERs revealed a significant main effect of Congruency, F (1, 24) = 36.933, *MS*E = .263, $p < .001$, $\eta_p^2 = .606$, with less errors on congruent perspectives trials than on incongruent perspectives trials, a main effect of Perspective, F (1, 24) = 13.245, *MSE* = .057, $p = .001$, $\eta_p^2 = .356$, with participants making less errors at judging from their own perspective than the avatar's perspective, a marginal main effect of SOA, F (1, 24) = 4.112, *MS*E = .020, $p = .054$, $\eta_p^2 =$ .146, with less errors on SOA 300-ms trials than on SOA 0-ms trials, and a significant Congruency x Perspective interaction effect, F (1, 24) = 13.395, *MSE* = .070, $p < .001$, η_p^2 = .367, with a higher effect of Congruency on other-perspective trials than on self-perspective trials and less and more errors on other-perspective trials than self-perspectives trials in the congruent and incongruent trials, respectively. Other interactions were not significant (all *p*s > .255). These results replicate the finding of the original study by Samson et al. (2010).

7.2 Results at the VPT task in Experiment 3

7.2.1 Reaction times.

The ANOVA 2 (Perspective instruction: self- vs. other-perspective) x 2 (Congruency: congruent vs. incongruent) x SOA (0-ms vs. 300-ms) conducted on the median RTs revealed a significant main effect of Congruency, F (1, 24) = 135.089, *MS*E = 1,966,144, $p < .001$, $\eta_p^2 = .849$, with faster responses on congruent perspectives trials than on incongruent perspectives trials, a marginal effect of Perspective, F (1, 24) = 3.914, *MSE* = 32,665, $p = .059$, $\eta_p^2 = .140$, with participants being faster at judging from their own perspective than the avatar's perspective, a significant main effect of SOA, F (1, 24) = 491.796, *MS*E = 2,347,077, $p < .001$, $\eta_p^2 = .953$, with faster responses on SOA 300-ms trials than on SOA 0-ms trials, a significant Congruency x Perspective interaction effect, F (1, 24) = 102.080, *MSE* = 379,320, $p < .001$, $\eta_p^2 = .810$, with a higher effect of Congruency on other-perspective trials than on self-perspective trials and faster and slower responses on other-perspective trials than self-perspectives trials in the congruent and incongruent trials, respectively, and a significant Congruency x SOA interaction effect, F (1, 24) = 8.727, *MSE* = 44,163, $p = .007$, $\eta_p^2 = .267$, with a higher Congruency effect on SOA 0-ms trials than on SOA 300-ms trials. Other interactions were not significant (all *p*s > .564). These results replicate the finding of the original study by Samson et al. (2010).

7.2.2 Error rates.

The ANOVA 2 (Perspective instruction: self- vs. other-perspective) x 2 (Congruency: congruent vs. incongruent) x SOA (0-ms vs. 300-ms) conducted on the ERs revealed a significant main effect of Congruency, F (1, 24) = 36.825, *MS*E = .558, $p < .001$, $\eta_p^2 = .605$, with less errors on congruent perspectives trials than on incongruent perspectives trials, a main effect of Perspective, F (1, 24) = 16.079, *MSE* = .073, $p = .001$, $\eta_p^2 = .401$, with participants making less errors at judging from their own perspective than the avatar's perspective, and a significant Congruency x Perspective interaction effect, F (1, 24) = 20.044, *MSE* = .184, $p < .001$, $\eta_p^2 = .455$, with a higher effect of Congruency on other-perspective trials than on self-perspective trials and less and more errors on other-perspective trials than self-perspectives trials in the congruent and incongruent trials, respectively. Other interactions were not significant (all *p*s > .285). These results replicate the finding of the original study by Samson et al. (2010).

Chapter 3

Effects of guilt, anger, and shame on perspective taking

Emotions can make us more or less egocentric. However, it remains unclear whether this results from a change in the cognitive control abilities allowing us to put aside our conflicting egocentric perspective or whether it results more directly from a change in how much attention we allocate to ourselves and other people. We used a visual perspective-taking task designed to disentangle these two hypotheses and examined the effects of anger and guilt. Experiment 1 showed that guilt made participants more other-oriented while anger tended to make them more self-centred. These two emotions had, however, no effect on the ability to handle conflicting perspectives. Since the method used to induce guilt in Experiment 1 also induced feelings of self-incompetence and shame, Experiment 2 aimed at isolating the effects of these concomitant feelings. Self-incompetence and shame reduced participants' ability to handle conflicting perspectives but did not make them more other-oriented. Altogether the results highlight different pathways by which emotional states can affect perspective taking.

Effects of guilt, anger, and shame on perspective taking

Henryk Bukowski, Dana Samson
Institut de recherche en sciences psychologiques, Université catholique de Louvain, Louvain-La-Neuve, Belgium

1. Introduction

Anger and guilt are core emotions thought to regulate social interactions. They arise from the violation of personal or moral standards which affect self and other judgements and have been described as having distinct intrinsic goals (Ausubel, 1955; Baumeister, Stillwell, & Heatherton, 1994; Haidt, 2003; Hall, 1899; Harth, Leach, & Kessler, 2013; Tangney, 1995). Anger towards others is usually described as aiming at punishing or threatening another person responsible for a bad action (Haidt, 2003; Izard & Ackerman, 2000). In contrast, guilt is described as aiming at repairing for one's own bad action through favouring prosocial behaviours (i.e., actions that benefit others, often at a personal cost; Batson & Powell, 2003) towards others (Baumeister et al., 1994). A large body of evidence supports the proposed link between these two emotions and social interactions. For example, guilt feelings have been associated with reparative actions (e.g., Cryder, Springer, & Morewedge, 2012; De Hooge, Zeelenberg, & Breugelmans, 2007; Ketelaar, Tung Au, & Au, 2003; Nelissen, Dijker, & Devries, 2007; Nelissen, Leliveld, van Dijk, & Zeelenberg, 2011; Regan, 1971) whereas anger feelings have been associated with punitive actions (e.g., Bosman, Sutter, & van Winden, 2005; Chow, Tiedens, & Govan, 2008; Hopfensitz & Reuben, 2009; Nelissen & Zeelenberg, 2009a; Pillutla & Murnighan, 1996).

As suggested by the studies referred to here above, it is mainly how our social behaviour is influenced by anger and guilt that has been studied so far. In contrast, little is known as to whether anger and guilt also affect another facet of social interactions, namely our ability to take another person's perspective. Every day we face social situations in which, we need to identify the expectations, beliefs, intentions, and feelings of the people we interact with in order to adapt our actions adequately. Hence, perspective taking (Premack & Woodruff, 1978; Preston & de Waal, 2002) is considered as a critical social skill for adaptation and even survival within human societies (Brüne & Brüne-Cohrs, 2006; de Waal, 2008).

So far only two studies have looked directly as to whether our emotional state influences perspective-taking performance (Converse et al., 2008; Yang et al., 2010). In the first study, Converse and colleagues (2008) reported evidence that people induced to feel happy showed worse perspective-taking performances than those induced to feel sad as measured by a false-belief task (in which participants had to estimate where another person – who did not share the same knowledge about the location of an object – would look for that object) and a referential communication task (in which participants had to interpret which object another person – who did not share the same visual perspective – is referring to). In both tasks, participants in a happy mood made more egocentric errors. The authors suggested that since our own perspective is often readily accessible by default, adopting someone else's perspective is a deliberative process requiring the inhibition of our own perspective. In line with previous studies related to the use of deliberate processing under positive and negative moods (e.g., Bless, 2001; Forgas, 1995), they stated that happy individuals are more likely than sad individuals to not deliberately incorporate knowledge about others but rather rely on their default egocentric perspective.

In the second study, Yang and colleagues (2010) induced guilt and shame feelings through an autobiographical recall following which participants were asked to rate how sarcastic a note left by a person would be interpreted by another naïve person. Since the scenario implied that the note was sarcastic but the naïve recipient had no way to know it, participants were assessed for their ability to inhibit their own privileged knowledge of the sarcastic nature of the note and to correctly infer that the naïve person would perceive the note as sincere. Participants in the guilt condition thought that the note would be perceived by the naïve recipient as less sarcastic than those in the neutral induction condition whereas participants in the shame condition perceived the note as more sarcastic than participants in the neutral induction condition. Yang and colleagues (2010) concluded that guilt leads to an increased tendency to engage in perspective taking whereas shame decreases this tendency.

In sum, there is some evidence that happiness and shame reduce while guilt increases participants' perspective-taking performance. In both studies, however (and in most perspective-taking tasks), successful performance does not depend only on participants' tendency to deliberately seek information about others but also on their ability to put aside their own conflicting and interfering point of view. Inhibiting our self-perspective is an effortful process which relies on general cognitive control abilities (or executive functions), such as inhibitory and monitoring skills (Carlson et al., 2002). Therefore it remains unclear from previous studies whether the emotional state impacted on general cognitive control abilities required to handle the conflicting perspectives or whether the emotional state changed directly the degree to which attention is self- versus other-oriented. In the latter case, by naturally orienting attention to oneself or someone else, the emotional state would indirectly impact on the demands of self-perspective inhibition when the other person's perspective is different to ours (increasing the inhibition demands in case of self-oriented attention and decreasing the inhibition demands in case of other-oriented attention).

The current study had two goals. First, given the opposite effects that anger and guilt have on prosocial behaviour, we wanted to examine whether opposite effects would also be observed in a perspective-taking task.

Secondly, we aimed to clarify the mechanisms through which different negative emotions influence perspective taking using a perspective-taking task (Samson et al., 2010) in which participants are asked to judge their own and someone else's visual perspective in situations where both perspectives are either consistent or inconsistent. By manipulating independently the perspective to judge and the level of conflict between perspectives, this design allowed to disentangle whether the emotional state changes the orientation of attention towards oneself versus another person (in which case we expected the emotional state to interact with the perspective factor) or whether the emotional state affects the cognitive control processes necessary to handle conflicting perspectives (in which case we expected the emotional state to interact with the consistency factor). In a previous study (Qureshi et al., 2010), it was shown that being engaged in a secondary task tapping onto inhibitory control while performing the visual perspective-taking task affected how participants handled conflicting perspectives but not whether they performed better in judging the self or the other person's perspective (i.e., independently of the perspective to take), supporting the view that handling conflicting perspectives requires domain-general cognitive control processes (e.g., Fizke, Barthel, Peters, & Rakoczy, 2014; Sabbagh, Moses, & Shiverick, 2006).

To our knowledge, there is so far no direct evidence about the potential effect of anger on perspective taking (or "cognitive" empathy, i.e., the ability to infer someone's mental state). However, anger is known to affect cognition by diminishing the likelihood of engaging in deliberate processing and by increasing the reliance on heuristic cues (Lerner & Tiedens, 2006). Thus, in line with Converse and colleagues (2008), we could expect that angry participants would have lower perspective-taking performances when perspective taking requires deliberate processing, i.e., when there is a conflict between one's own and someone else's perspective. Such reduction of perspective-taking performance would therefore result from reduced cognitive control abilities to handle conflicting perspectives. On the other hand, Singer and colleagues (2006) have shown reduced aversive emotional neural responses and increased hedonic neural responses to the pain inflicted to another person when participants were angry at this person compared to when they were not angry at this person. This finding suggests that anger reduces affective empathy (i.e., the ability to emotionally connect with someone else) by making participants more centred on their own feelings rather than on the contagious and intruding feelings of suffering felt by the other person. Therefore, if such reduction of affective empathy translates to cognitive empathy, it could result from a change in the orientation of attention towards oneself versus another person rather than a change in cognitive control abilities. Altogether, previous evidence of effects of anger on cognition and on affective empathy lead us to expect a reduction of perspective-taking performance but it is unclear through which pathway such reduction would occur.

Concerning guilt, Yang and colleagues (2010) showed that guilt increased perspective-taking performance. Given that guilt is often found to promote prosocial goals and described as a relationship-oriented emotion (Baumeister et al., 1994; Leith & Baumeister, 1998), one could expect that the effect of guilt on perspective taking results from more attention being allocated to the other person than oneself. However, several studies have suggested that guilt is in fact a self-focused emotion aiming at repairing one's own misdeed rather than reducing others' suffering (Iyer, Leach, & Crosby, 2003; Iyer & Leach, 2009). The enhanced perspective-taking abilities may thus not be related to the relative weight given to oneself and the other person but rather through the cognitive control pathway, by increasing the ability to handle conflicting perspectives. This alternative hypothesis is in line with some studies that have shown that guilt increases cognitive control and depth of cognitive processing (Gangemi & Mancini, 2007; Lassiter, 2012). Altogether, we are still missing clear and direct evidence about the pathway through which guilt affects perspective-taking.

Finally, because anger and guilt are known to influence prosocial behaviour, we added a prosocial behaviour measure following the perspective-taking task in order to verify whether the targeted feelings were successfully induced. Previous studies suggest that anger should reduce prosocial behaviour (e.g., Chow et al., 2008; Hopfensitz & Reuben, 2009) while guilt should increase prosocial behaviour (e.g., Ketelaar et al., 2003; Nelissen et al., 2007).

In Experiment 1, participants played an interactive game with another person in order to induce contrasting emotional feelings (guilt vs. anger vs. control). We then measured participants' perspective-taking performance with a visual perspective-taking task and their prosocial behaviour through their propensities to allocate raffle tickets to the other person and a charity. Experiment 2 aimed to isolate the effect of self-incompetence and shame which were concomitantly induced with guilt in Experiment 1 in order to ensure that the effects of guilt observed in Experiment 1 were truly due to guilt and not a confounding emotion.

2. Experiment 1

2.1 Method

2.1.1 Participants.

Fifty-one healthy individuals were randomly assigned to one of the three conditions (17 participants in the guilt condition, 16 participants in the anger condition and 18 participants in the control condition). Four participants in the anger condition did not feel anger following the induction procedure and were thus replaced by an additional set of 4 participants who reported anger feelings (27 females, mean age: 21.50, age range: 18-31). Participants participated in return of a 1/60 chance to win 150 euros and were also told that they would receive an additional monetary compensation which depended upon their partner's performance in a card game. The study was approved by the ethics committee of the Psychological Sciences Research Institute of the Université catholique de Louvain.

2.1.2 Material and procedure.

Initial social interaction.

At the beginning of the experiment, the participant and a female confederate student were brought into a room where the experimenter welcomed the two persons and explained them the procedures as if they were both naïve participants. After both read the instructions and signed the consent forms, the experimenter asked to pick one of his hands which concealed a number that determined the order of play in the first game. The confederate knew what hand to pick and rapidly made her choice. Then, the two persons completed the Interpersonal Reactivity Index (IRI; Davis, 1983), a questionnaire measuring participants' agreement on a 5-point Likert scale with 28 statements about their personal experiences in social and emotional situations. Four subscales of 7 items each assessed participants' tendencies to show empathic concern, perspective taking, fantasy (i.e. self-absorption in fictions), and personal distress. While one person was completing the IRI questionnaire, the other person was brought in front of a white panel to take 3 photographs. A front view photograph provided the portrait used in the Card Picking Game (described below) and two sideways photographs (supposedly) provided the stimuli for the visual perspective-taking task. The two persons were then brought in two adjacent rooms for the remaining of the experiment.

Emotional induction with the Card Picking Game.

Participants were asked to complete the Card Picking Game, a computerized pseudo-interactive card game. The principle of the game was to pick one card among two, knowing that only one of the two cards will result in a monetary gain. The winning card showed "+1 euro" on one of its side and the other card showed "+0 euro" on one of its side. The back sides of the two cards were identical. The cards were first shown face up so that participants could identify where the winning card was located. The cards were then turned over and moved around the screen crossing each other's path. The participants were led to believe that they played with their game partner (i.e. the confederate) over the local network. For each trial, when the active player picked the money-winning card, the passive player's monetary reserve was increased by 1 euro. In other words, the participants were led to believe that they and their partner were playing for the other player's earnings (for details about how the Card Picking Game was implemented, see the first section of the Supplementary information).

The card game was manipulated in 4 ways. Firstly, irrespective of the card that was chosen, the value (+1 or +0) that was shown was predefined depending on the experimental condition. Secondly, the speed of movement and the amount of times that the cards crossed each other's path was manipulated so that it was difficult but not impossible to locate the winning card. This was done so that participants could not be 100% sure that they choose the correct card, thereby decreasing any suspicion that the game was fixed. Thirdly, although participants were led to believe that there was a real game partner, the game partner's rounds were entirely controlled by the computer. Fourthly, a 2 euro bonus feature was added to the game: whoever received the bonus could decide to keep it all for him/herself, share it with the partner or give it all to the partner. The bonus feature appeared on the screen after the 8th trial of the partner's rounds. Participants were led to believe that the game partner was randomly designated to receive the bonus. These features allowed us to induce the target emotions.

For the *anger* induction, the participant played first and, irrespective of the card chosen, the value of the chosen card was always "+1 euro". This led the participants to believe that they performed perfectly on the 8 trials thereby making their partner earn 8 euros. For the partner's rounds, on only 2 out of the 8 trials was the chosen card the winning one. Thus the fictive game partner made the participants earn only 2 euros. Moreover, the game partner chose to keep the 2 euros bonus for herself.

For the *guilt* induction, the partner's rounds were presented first and, on all 8 trials, the chosen card was the winning one which led the participants to believe that the game partner made them earn 8 euros. It was then the participants' turn to play, and on only 2 out of the 8 trials was the chosen card the winning one. Thus, the participants were led to believe that they made their game partner earn only 2 euros. (This procedure was inspired by the procedure used by Nelissen & Zeelenberg, 2009b). Moreover, the game partner chose to give half of the 2 euros bonus to the participant.

For the *control* condition, the order of play was counterbalanced across participants and both the participant and the confederate chose the winning card on 8 out of the 8 trials. There was no bonus in the control condition.

Visual perspective-taking task.

Immediately following the Card Picking Game, participants were asked to complete a visual perspective-taking task (Samson et al., 2010). In the task, participants saw pictures of their game partner positioned in the centre of a room with red discs displayed on one or two of the side walls (see Figure 1). The game partner was seen sideways facing either the left or the right wall; participants were led to believe that these pictures were edited based on the two photographs of the partner taken earlier. The principle of the task was to judge whether a certain number (ranging from 0 to 3) matched the number of discs visible from either the participant's perspective (self-perspective condition) or from the game partner's perspective (other-perspective condition). The number of discs visible could be the same for both perspectives (consistent perspectives condition) or different (inconsistent perspectives condition). Furthermore, the digit given could match or mismatch the content of the picture from the given perspective. As in the original paradigm, because mismatching trials in the consistent condition always displayed digit cues irrelevant to any perspectives and thus were particularly easy to process, mismatching trials were unbalanced in terms of performance difficulty with matching trials and were thus not analysed. The task included a total of 234 trials, evenly spread across experimental conditions and divided into 4 blocks of 52 trials plus a set of 26 practice trials. Like in the original study by Samson and colleagues (2010) we included 18 filler trials to avoid anticipatory responses (see the original study for details). Trials within each block were presented in a randomized order. The task lasted around 20 minutes.

The task ran on E-prime (Psychology Software Tools, Pittsburgh, PA, USA), with the exact same timing of events as in the original study by Samson and colleagues (2010; see Figure 1).

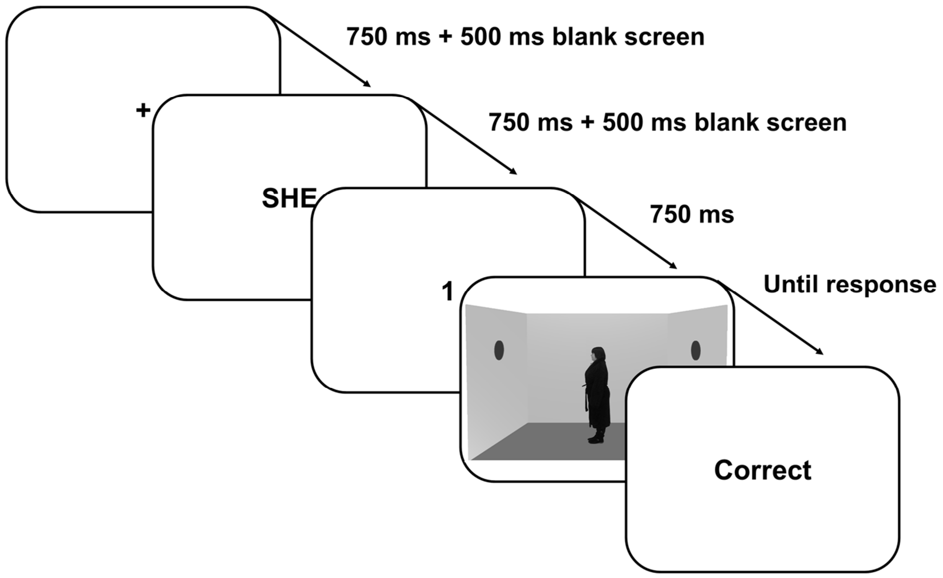


Figure 1. Illustration of a trial of the inconsistent perspectives / other-perspective condition in the visual perspective-taking task. In this trial, participants had to judge whether the game partner saw or not 1 disc. The last screen displayed the feedback about participant’s accuracy of response.

Prosocial behaviour assessment with the Raffle task.

Once the visual perspective-taking task was completed, participants received 12 raffle tickets and were told that each ticket gives one chance out of 720 to win the 150 euros prize. Moreover, they were told that the partner did not receive these tickets because only the person who played first/second in the Card Picking Game receives the raffle tickets (depending on whether the participant was first or second in that game). This justification was convincing since it was explicitly stated in the consent form that the tickets would be randomly allocated to one of the players based on the number they would pseudo-randomly pick from the experimenter’s hands. For each raffle ticket, participants were asked to choose among 3 options for the course of action to follow in case the ticket is the winning one: (1) keep the prize for themselves, (2) give it to their game partner, (3) give it to the Red Cross. The decision was made by ticking the chosen recipient on each ticket. Importantly, participants were told that the whole procedure was anonymous and participants were invited to make their choice privately once the examiner had left the room by slipping the tickets in a locked wooden box.

Induction efficacy.

In order to insure that the emotion inductions were successful, the participants completed at the end of the experiment a questionnaire asking about how they felt after the Card Picking Game. The participants rated to what extent they felt a series of (1) 12 emotions (items adapted from Wallbot & Scherer, 1986), (2) 13 body sensations (items adapted from Izard, Libero, Putnam, & Haynes, 1993) and (3) 11 action tendencies (items adapted from Youngstrom & Green, 2003). All ratings were made on a 7-point intensity scale where 0 meant “Not at all” and 6 meant “Strongly”. Participants were also asked questions about how fair and nice they perceived their game partner to be (see all items of the questionnaire in the second section of the Supplementary information).

Debriefing.

At the end of the experiment, the experimenter revealed and explained the reasons for all the deceptive aspects. Each participant was then compensated with 10 euros and one true raffle ticket. Participants were invited to rate and comment on the extent to which the deceptive aspects (confederate, card game, and raffle ticket sharing) were credible. The ratings could go from 0, meaning ‘Not at all convincing’, to 6, meaning ‘Strongly convincing’, and averaged above 5 across all conditions and deceptive components.

2.2 Results

2.2.1 Induction efficacy.

All participants in the guilt condition felt guilt at an intensity of at least 2 and none of the participants in the control condition felt anger or guilt at an intensity of 2 or above. Four participants reported anger feelings below an intensity of 2 and were thus replaced with an additional set of 4 participants who felt anger at an intensity of 2 or more.

All ANOVAs revealed a significant effect of Emotion induction (anger vs. guilt vs. control) on the subjective ratings of all emotion items (all ps < .005) but only a marginal effect on the ‘attention’ item, F (2,48) = 2.783, p = .072. Participants in the guilt condition felt significantly more guilt than the participants in the anger condition, t (31) = 13.948, p < .001, and the control condition, t (33) = 18.380, p < .001 (see Figure 2(a)). They also felt more shame than the participants in the anger condition, t (31) = 3.885, p = .001, and the control condition, t (33) = 9.721, p < .001. Moreover, they judged their game partner as fairer, t (31) = 7.403, p < .001, and nicer, t (31) = 6.746, p < .001, than those in the anger condition and also nicer, t (33) = 2.485, p = .018, but not fairer, t (33) < 1, p = .536, than those in the control condition. Within the guilt condition, participants felt significantly more guilt than any other emotion (including shame, all ps < .05; see Figure 2(a)). Participants in the anger condition felt more anger, disgust, and disdain than those in the guilt condition, *t* (31) = 2.281, *p* = .030, *t* (31) = 2.800, *p* = .009, *t* (31) = 3.453, *p* = .002, respectively, and in the control condition, *t* (32) = 11.674, *p* < .001, *t* (32) = 7.147, *p* < .001, *t* (32) = 4.616, *p* < .001, respectively. Within the anger condition, participants felt significantly more anger than any other emotion, all *p*s < .01, except for disgust, *t* (26) = 1.246, *p* = .232, and surprise, *t* (26) < 1, *p* = .621, which were nevertheless felt to a smaller extent (see Figure 2(a)).

Participants in the control condition felt more happiness than those in the anger condition, *t* (32) = 6.418, *p* < .001, and guilt condition, *t* (33) = 5.385, *p* < .001. Within the control condition, participants felt significantly more happiness than any other emotion, all *p*s < .001, except for amusement, *t* (17) = 1.327, *p* = .202, and attention, *t* (17) < 1, *p* = .681. Altogether, these results suggest that the participants felt the targeted emotional feelings (see Figure 2(a)).

For both the guilt and the anger conditions, participants felt significantly more body sensations and action tendencies than participants in the control condition, indicating that the manipulation succeeded in inducing emotional “responses”. Participants in the guilt condition were more willing to go towards someone or something and to disappear or dissolve; those in the anger were more willing to badmouth, to go towards someone or something, to kick, hit, or destroy, to yell, scream, or swear; those in the control condition were more willing to sing, dance, jump, or laugh (see the second section of the Supplementary information for details).

In summary, the induction of the targeted emotional feelings was overall successful.

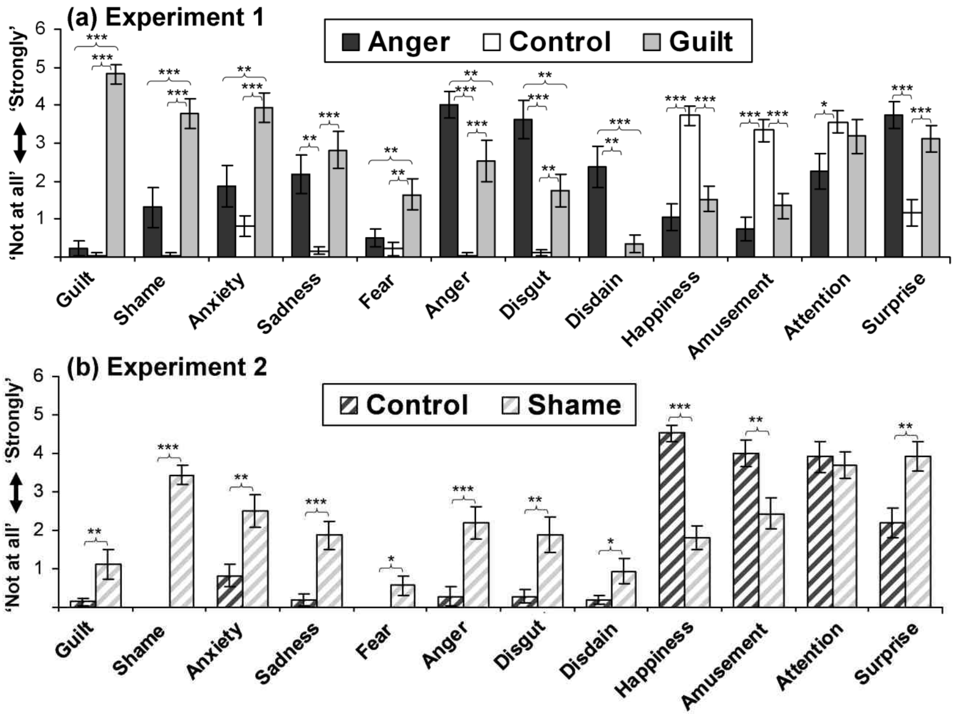


Figure 2. Means of self-reported emotion ratings in Experiment 1 (a) and Experiment 2 (b). Error bars represent standard errors. * = *p* < .05, ** = *p* < .0, *** = *p* < .001.

2.2.2 Equivalence of participants' characteristics across the three experimental conditions.

The 51 participants were evenly distributed in terms of gender, χ^2 (2, 51) < 1, $p = .838$, and age, F (2, 47) < 1, $MSE = 2.257$, $p = .725$, $\eta^2 = .014$, across the anger, the guilt and the control conditions. Furthermore, the 3 experimental groups did not differ in terms of their overall IRI score, F (2, 48) < 1, $p = .474$, $\eta^2 = .031$, nor on any of its subscales, all *F*s < 1.685, all *p*s > .195, and were thus evenly distributed across conditions in terms of dispositional empathy.

2.2.3 Visual perspective-taking task.

Similarly to the study by Samson and colleagues (2010), only matching trials were taken into account for the analyses.

Reaction times.

Erroneous responses (5.25% of the data), response omissions due to the timeout procedure (0.49% of the data) as well as RTs beyond 2.5 *SD* of the mean RT of the experimental condition (3.3% of the data) were eliminated from the data set.

A 2 x 2 x 3 ANOVA was conducted with the Consistency between the two perspectives (consistent vs. inconsistent perspectives) and the Perspective to judge (self- vs. other-perspective) as within-subject variables, and the Emotion (anger vs. guilt vs. control) as a between-subject variable. In line with the results reported in the original study (Samson et al., 2010), the ANOVA revealed a significant main effect of Consistency, F (1, 48) = 51.872, MSE = 226,346, p < .001, η_p^2 = .19, with faster responses in consistent than inconsistent perspectives trials, no significant main effect of Perspective, F (1, 48) < 1, MSE = 1,073, p = .606, η_p^2 = .006, and a significant Consistency x Perspective interaction effect, F (1, 48) = 33.478, MSE = 85,229, p < .001, η_p^2 = .411, with a larger Consistency effect when participants judged the other person's perspective than their own perspective. These results replicate all the effects found in the original study (Samson et al., 2010) and show that the task was properly completed.

Of particular interest to the current study were any effects of Emotion (see Figures 3 and 4(a)). The main effect of Emotion was not significant, F (2, 48) = 1.140, MSE = 132,977, p = .328, η_p^2 = .045. However, the Perspective x Emotion interaction was significant, F (2, 48) = 4.580, MSE = 18,241, p = .015, η_p^2 = .160. No other interaction was significant (Consistency x Emotion: F (2, 48) < 1, MSE = 2,803, p = .530, η_p^2 = .026; Perspective x Consistency x Emotion: F (2, 48) = 2.170, MSE = 5,525, p = .125, η_p^2 = .083).

To explore the Perspective x Emotion interaction effect, we conducted separate paired-t tests for each Emotion condition to test the effect of Perspective. There was a significant effect of Perspective among the participants in the guilt condition, t (16) = 2.516, p = .023, d = 0.61, with a 44 ms advantage when taking their partner's perspective. There was no significant effect of Perspective among the participants in the anger condition, t (15) = 1.113, p = .283, d = 0.28, and in the control condition, t (17) < 1, p = .538, d = 0.13. In order to compare the Perspective effects between the emotion conditions, a one-way ANOVA was conducted on the perspective differences (i.e., mean RT of self-perspective trials minus mean RT of other-perspective trials) with the Emotion as a between-subjects variable. There was a significant effect of Emotion on the perspective differences, F (2, 48) = 4.514, MSE = 34,529, p = .016, η^2 = .158. Planned contrasts revealed a significantly higher mean RT perspective difference in the guilt condition than in the anger condition, t (48) = 2.718, p = .009, d = 0.98, and the control condition, t (48) = 2.467, p = .017, d = 0.86. The mean RT perspective difference was not significantly different between the anger and control condition, t (48) < 1, p = .745, d = 0.12.

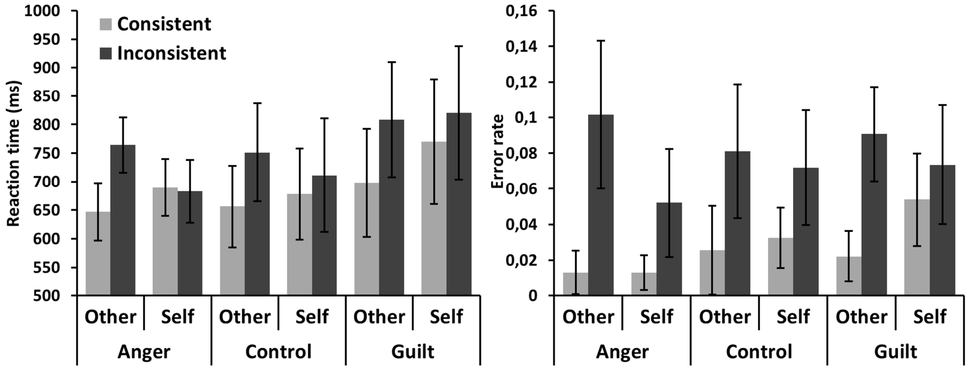


Figure 3. Mean RTs (left panel) and ERs (right panel) in the visual perspective-taking task of Experiment 1 as a function of the Perspective, Consistency, and Emotion conditions. Error bars represent 95% confidence intervals.

Error rates.

Response omissions due to the timeout procedure (> 2000 ms) were counted as errors. A 2 x 2 x 3 ANOVA was conducted on the error rates (ER) with the Consistency between the two perspectives and the Perspective to judge as within-subject variables, and the Emotion as a between-subject variable. The ANOVA revealed a significant main effect of Consistency, F (1, 48) = 43.584, MSE = .136, p < .001, η_p^2 = .476, with better performances in consistent than inconsistent perspectives trials, no significant main effect of Perspective, F (1, 48) < 1, MSE = .002, p = .379, η_p^2 = .016, and a significant Consistency x Perspective interaction effect, F (1, 48) = 8.388, MSE = .019, p = .006, η_p^2 = .149, with a larger Consistency effect when participants judged the other person's perspective than their own perspective. These results replicate all the effects found in the original study and show that the task was properly completed.

Of particular interest to the current study were any effects of Emotion (see Figures 3 and 4(a)). The main effect of Emotion was not significant, F (2, 48) < 1, MSE = .004, p = .506, η_p^2 =.028, and the Emotion did not significantly interact with any of the other variables (Perspective x Emotion: F (2, 48) = 1.835, MSE = .005, p = .171, η_p^2 = .071; Consistency x Emotion: F (2, 48) < 1, MSE = .002, p = .563, η_p^2 = .024; Perspective x Consistency x Emotion: F (2, 48) < 1, MSE = .002, p = .493, η_p^2 = .029).

To make inspect whether there was a speed-accuracy trade-off in our results, we explored the Perspective x Emotion interaction. We conducted separate paired-t-tests for each Emotion condition to test the effect of Perspective. There were no significant effects of Perspective (anger: t (15) = 1.735, p = .103, d = 0.43; guilt: t (16) < 1, p = .422, d = 0.20; control: t (17) < 1, p = .928, d = 0.02). The participants in the guilt condition showed the highest other-perspective advantage, with 0.74% less errors at judging from their partner's perspective relatively to their own perspective. The participants in control and anger conditions made respectively 0.12% less errors and 2.47% more errors at judging from their partner's perspective relatively to their own perspective. These results suggest that the perspective effects found in the anger, control, and guilt conditions in the RT analyses were not due to a speed-accuracy trade-off.

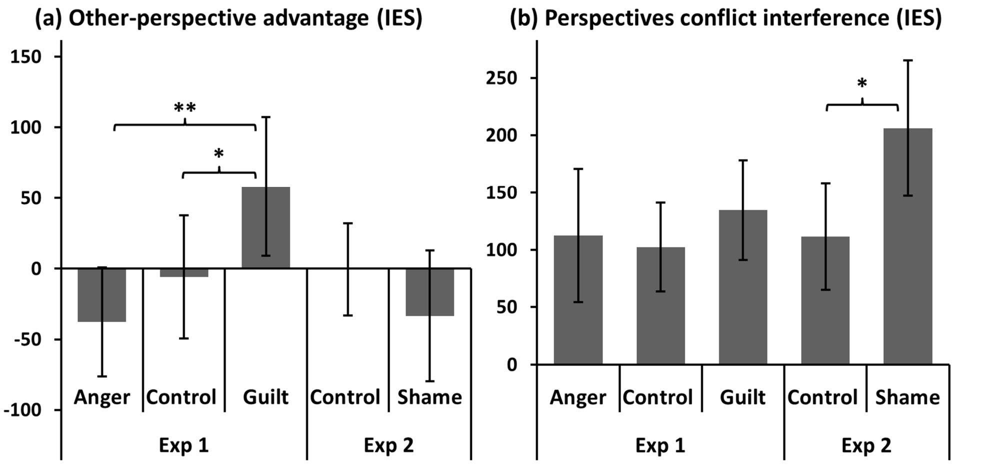


Figure 4. (a) Other-perspective advantage (self-perspective vs. other-perspective) and (b) interference due to perspectives conflict (inconsistent perspective vs. consistent perspective) of the participants in the visual perspective-taking task as a function of Experiment and Emotion conditions. For the purpose of between-subjects comparisons and because the mean ER was below .10, indexes were calculated from the inverse efficiency scores (IES; formula: RT/(1-ER)). Error bars represent 95% confidence intervals. * = *p* .05, ** = $p < .01$.

2.2.4 Raffle task.

We conducted separate ANOVAs on the number of tickets (out of the 12 given to them) that participants allocated to each of the 3 possible recipients (the participant him/herself vs. his/her game partner vs. the Red Cross), with the Emotion as a between-subject variable (see Figure 5). There was a significant main effect of Emotion on the number of tickets allocated to the game partner, F (2, 48) = 8.921, MSE = 31.503, p = .001, η^2 = .271, but there was no significant effect of Emotion on the number of tickets allocated to the Red Cross, F (2, 48) < 1, MSE = 5.696, p = .412, η^2 = .036, and only a marginal effect for allocation to themselves, F (2, 48) = 2.716, MSE = 29.042, p = .076, η^2 = .102. Planned contrasts revealed that participants allocated more tickets to their partner in the guilt condition, M = 2.765, SD = 2.488, than in the anger condition, M = 0, SD = 0, t (48) = 4.224, p < .001, d = 1.52, and than in the control condition, M = 1.444, SD = 2.036, t (48) = 2.077, p = .043, d = 0.72. Moreover, participants in the anger condition allocated less tickets to their partner than the participants in the control condition, t (48) = 2.237, p = .030, d = 0.79. Concerning ticket allocations to themselves, participants in the anger condition kept significantly more tickets than of those in the guilt condition, t (48) = 2.104, p = .041, d = 0.76, and marginally more than those in the control condition, t (48) = 1.953, p = .057, d = 0.69.

In sum, these results suggest that the participants' propensity to behave prosocially was not modulated in terms of altruism in the broad sense (i.e. giving to a charity) but specifically when the opportunity to behave prosocially was directed towards their game partner, that is, a recipient related to the felt emotional state. Participants' propensity to behave prosocially towards their partner was higher in the guilt condition and lower in the anger condition compared to the control condition.

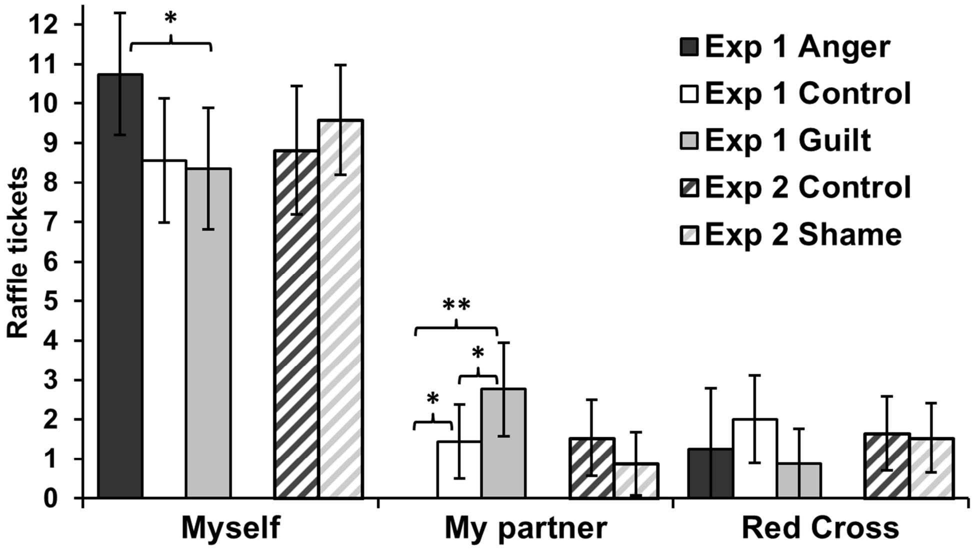


Figure 5. Number of raffle tickets that participants allocated to their partner, the Red Cross, and themselves in Experiment 1 and 2. Error bars represent 95% confidence intervals. * = $p < .05$, ** = $p < .01$.

2.3 Intermediary discussion

Contrasting profiles across participants in the guilt and anger conditions were found both in the visual perspective-taking and the Raffle tasks. Participants in the guilt condition showed an overall other-perspective advantage (while a trend for a self-perspective advantage was observed in the anger condition), and they gave significantly more raffle tickets to their game partner than the participants in the anger condition.

The guilt induction in the Card Picking Game of Experiment 1 was achieved by making participants perform badly and unable to reciprocate the amount of money that their game partner gave them in the first round. While this procedure successfully induced guilt, it also induced a feeling of shame (*M* = 3.765) probably originating from a feeling of self-incompetence at the card game. Indeed, feeling incompetent is often associated with shame (Ausubel, 1955; Gausel & Leach, 2011; Keltner, 1996; R. H. Smith, Webster, Parrott, & Eyre, 2002; Tracy & Robins, 2006). A replication of the guilt induction in a new set of 17 participants indicated that, indeed, participants felt not only guilt (*M* = 4.722, *SD* = 1.320) but also shame (*M* = 3.611, *SD* = 2.033) and low self-competence (*M* = 1.000, *SD* = 1.138; on a scale ranging from 0, meaning "Not competent", to 6, meaning "Highly competent"). Congruently, shame was positively associated with guilt, $r(18) = .593$, $p = .009$, and negatively associated with self-competence, *r*(18) = -.407, *p* = .094, but guilt was not associated with self-competence, *r*(18) = .000, *p* = 1. (The effects of guilt on the perspective-taking task were also replicated, see Appendix 1.) It is thus unclear whether the other-oriented perspective-taking performance in the guilt condition found in our study was driven by guilt or rather shame/self-incompetence feelings. Experiment 2 aimed at specifically inducing feelings of shame/self-incompetence without feelings of guilt to rule out that the effects observed in Experiment 1 were due to these concomitant feelings rather than guilt. The procedure was identical to Experiment 1, with the same dependent variables, except that the induction procedure now allowed us to specifically manipulate perceived self-competence.

3. Experiment 2

3.1 Method

3.1.1 Participants.

Thirty-four healthy individuals were randomly assigned to one of the two conditions (17 participants in the shame condition and 17 participants in the control condition). Five participants in the shame condition did not feel shame following the induction procedure and were thus replaced by an additional set of 5 participants who reported shame feelings (19 females, mean age: 21.00, age range: 18-25). Participants participated in return of 16 euros and a 1/60 chance to win 150 euros. The study was approved by the ethics committee of the Psychological Sciences Research Institute of the Université catholique de Louvain.

3.1.2 Material and procedure.

The procedure was similar to Experiment 1 except for the following changes. First, participants did not meet their partner (i.e. a female confederate). Instead, they were told that the partner had already participated and that her performance during the Card Picking Game was filmed and would be shown to them during the experiment. This allowed showing the partner acting with care thereby reducing the likelihood that participants would judge the partner’s good or bad performance as originating from chance or carelessness. Participants’ performance was also filmed, and they were told that this video would be shown to their partner when they meet with her after the experiment. This was done to increase the deceptive effectiveness by matching the treatment of the participant to those of the confederate. Secondly, participants’ earnings were no more dependent on their game partner’s performance in the Card Picking Game and the 2 euros bonus was removed. There were thus no moral expectations anymore that could have led to guilt or anger. Finally, the Card Picking Game had 6 consecutive trials rather than 8 to ensure that the bad performance would not appear as worse than chance level and hence suspicious. Together, these changes allowed to specifically manipulate perceived competence.

In the control/self-competence induction, participants played first and, irrespective of the card chosen, the value of the chosen card was always “+2 coins”. This led participants to believe that they performed perfectly on the 6 trials and thereby collected 12 coins. They then watched the recording of the game partner’s performance. The video showed the game partner choosing the winning card only twice on 6 trials and thus collecting 4 coins. In sum, participants were led to believe that they were perfectly competent at finding the winning card whereas the game partner was incompetent at finding it.

In the shame/self-incompetence induction, participants played first and, irrespective of the card chosen, the value would be “+2 coins” only twice over 6 trials. This led participants to believe that they performed poorly, collecting only 4 coins. They then watched the recording of the game partner’s performance. The video showed the game partner choosing the winning card on the 6 trials and thus collecting 12 coins. In sum, participants were led to believe that they were incompetent at finding the winning card whereas the game partner was competent at finding it. Such exposure to incompetence was aimed at inducing shame (Ausubel, 1955; Keltner, 1996).

Visual perspective-taking task, raffle task, induction efficacy and debriefing.

The rest of the procedure went on as in Experiment 1 with the addition of 2 items in the exit questionnaire to rate the perceived self- and other-competence. The ratings for credibility of the experiment, averaged above 4.55 across all conditions and deceptive components.

3.2 Results

3.2.1 Induction efficacy.

None of the participants in the control condition felt shame at an intensity of 2 or above. Five participants in the shame condition reported shame feelings below an intensity of 2 and were thus replaced with an additional set of 5 participants who felt shame at an intensity level of 2 or more.

Relatively to the participants in the control condition, participants in the shame condition reported higher emotional intensities on all negative emotions (all *p*s < .05), with shame being felt most strongly, $M = 3.352$, $SD = 1.057$, $t\ (32) = 13.077$, $p < .001$ (see Figure 2(b)). Relatively to the control condition, participants in the shame condition reported less amusement, $t\ (32) = 3.023$, $p = .005$, and happiness, $t\ (32) = 8.628$, $p < .001$, more surprise, $t\ (32) = 2.494$, $p = .018$, and a similar level of attention, $t\ (37) < 1$, $p = .567$. The level of intensity of guilt in the shame condition of Experiment 2, $M = 1.176$, $SD = 1.509$, was significantly smaller than in the guilt condition of Experiment 1, $t\ (32) = 8.115$, $p < .001$, while a similar level of shame was found in both experiments, $t\ (35) < 1$, $p = .332$. Participants in the shame condition felt more shame than any other emotion (including guilt; all *p*s < .05) except attention, $t\ (16) < 1$, $p = 1.000$, and surprise, $t\ (16) < 1$, $p = .361$. Within the control condition, participants felt more happiness than any other emotion (all *p*s

< .05) except attention, t (16) = 1.900, p = .076. Finally, participants in the shame condition perceived themselves as less competent, M = 0.880, SD = 0.600, than their partner, M = 5.820, SD = 0.829, t (16) = 27.253, p < .001, and than those in the control condition, M = 5.840, SD = 0.375, t (32) = 28.397, p < .001. Participants in the control condition perceived themselves as more competent, M = 5.823, SD = 0.393, than their partner, M = 2.235, SD = 0.903, t (16) = 12.583, p < .001.

The analyses conducted on the body sensation and action tendency items showed that the participants of the shame condition felt a series of body sensations and actions tendencies to a greater extent than those in the control condition, which indicates that the shame induction succeeded in inducing emotional "responses". The participants of the shame condition were more willing to avoid or leave, to shelter or protect themselves, to yell, scream, or swear (see the second section of the Supplementary information for details).

In summary, the participants of the shame condition did feel shame above all other emotions and felt no guilt whereas those in the control condition did not report any feeling of shame (see Figure 2(b)).

3.2.2 Equivalence of participants' characteristics between the two experimental conditions.

The age of 2 participants was not encoded due to a technical failure. The control and shame groups did not differ in terms of age, t (32) < 1, p = .559, or gender, χ^2 (1, 34) = 1.074, p = .300. Furthermore, the 2 experimental groups did not differ in terms of their overall IRI score, t (32) = < 1, p = .614, nor on any of the IRI subscales, all ps > .260.

3.2.3 Visual perspective-taking task.

Reaction times.

Erroneous responses (5.5% of the data), response omissions due to the timeout procedure (1.9% of the data), and RTs beyond 2.5 SD of the mean RTs of each experimental condition (3.6% of the data) were eliminated from the data set.

The ANOVA 2 (Perspective) x 2 (Consistency) x 2 (Emotion) revealed a significant main effect of Consistency, F (1, 32) = 74.010, MSE = 232,515, p < .001, η_p^2 = .698, no main effect of Perspective, F (1, 32) < 1, MSE = 2,442, p = .473, η_p^2 = .016, and a significant Consistency x Perspective interaction effect, F (1, 32) = 13.617, MSE = 52,490, p < .001, η_p^2 = .299. The directions of the effects were the same as in the original study and Experiment 1.

Of particular interest to the current study were any effects of Emotion (see Figures 6 and 4(b)). The main effect of Emotion was not significant, F (1, 32) < 1, MSE = 11,102, p = .708, η_p^2 = .004. The Perspective x Emotion interaction was not significant, F (1, 32) < 1, MSE = 4,364, p = .339, η_p^2 = .029, but the Consistency x Emotion interaction was significant, *F* (1, 32) = 7.832, *MSE* = 24,605, *p* = .009, η_p^2 = .197. Finally, the Perspective x Consistency x Emotion interaction was not significant, *F* (1, 32) < 1, *MSE* = 333, *p* = .771, η_p^2 = .003.

In order to compare the Consistency effects between the shame and control conditions, a t test for independent samples was conducted on the consistency differences (i.e., mean RT of inconsistent perspectives trials minus mean RT of consistent perspectives trials) with the Emotion as a between-subjects variable. There was a significant effect of Emotion on the consistency differences, *t* (32) = 2.757, *p* = .010, *d* = 0.97, with a higher interference in the shame condition, *M* = 107.838, *SD* = 67.394, than in the control condition, *M* = 56.344, *SD* = 37.248.

Error rates.

As for the previous experiment, response omissions due to the timeout procedure (> 2000 ms) were counted as errors. The ANOVA 2 (Perspective) x 2 (Consistency) x 2 (Emotion) revealed a significant main effect of Consistency, *F* (1, 32) = 46.885, *MSE* = .172, *p* < .001, η_p^2 = .594, no main effect of Perspective, *F* (1, 32) = 1.800, *MSE* = .004, *p* = .189, η_p^2 = .053, and a significant Consistency x Perspective interaction effect, *F* (1, 35) = 8.257, *MSE* = .011, *p* = .007, η_p^2 = .205. The directions of the effects were the same as in the original study and Experiment 1.

Of particular interest to the current study were any effects of Emotion (see Figures 6 and 4(b)). The main effect of Emotion was not significant, *F* (1, 32) = 1.633, *MSE* = .020, *p* = .210, η_p^2 = .049. The Emotion x Perspective and Emotion x Perspective x Consistency interactions were not significant, *F* (1, 32) < 1, *MSE* = .001, *p* = .658, η_p^2 = .006, *F* (1, 32) < 1, *MSE* = .001, *p* = .345, η_p^2 = .028, respectively, but the Emotion x Consistency interaction was marginally significant, *F* (1, 32) = 3.568, *MSE* = .013, *p* = .068, η_p^2 = .100.

To inspect whether there was a speed-accuracy trade-off in our results, we explored the Consistency x Emotion interaction. In order to compare the Consistency effects between the shame and control conditions, a t-test for independent samples was conducted on the consistency differences (i.e., mean ER of inconsistent perspectives trials minus mean ER of consistent perspectives trials) with the Emotion as a between-subjects variable. There was a marginally significant effect of Emotion on the consistency differences, *t* (32) = 1.750, *p* = .090, *d* = 0.62, where participants in the shame condition made on average 5.01% more errors on inconsistent than consistent perspectives trials whereas participants in the control condition made only 2.87% more errors. These results suggest that participants did not differ in terms of performances in taking one perspective over another and that the difference of consistency effects between the shame and control conditions on RTs was not due to a speed-accuracy trade-off.

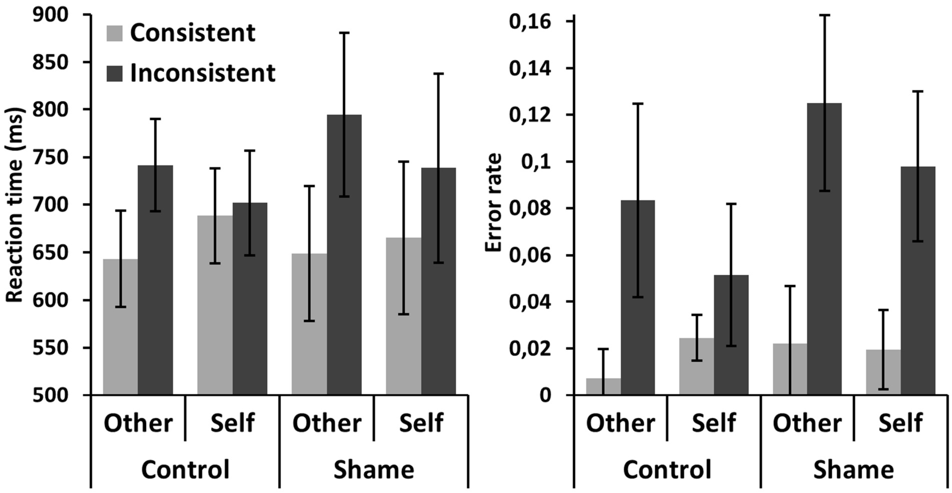


Figure 6. Mean RTs (left panel) and ERs (right panel) in the visual perspective-taking task of Experiment 2 as a function of the Perspective, Consistency, and Emotion conditions. Error bars represent 95% confidence intervals.

In sum, our results suggest that participants did not differ in terms of their ease of taking one perspective over another but were different in terms of their ease in dealing with conflicting perspectives: participants in the shame condition were less efficient in handling conflicting perspectives than the participants in the control condition (see Figure 4(b)). This modulatory effect found in the shame condition was thus different in nature to the one observed in the guilt condition in Experiment 1. We can thus conclude that the effect of guilt observed in Experiment 1 was not an artefact of the effect of shame or self-incompetence.

3.2.4 Raffle task.

There was no difference between the shame and control conditions regarding the number of tickets the participants allocated to their game partner, t (32) < 1, p = .489 d = 0.25, to themselves, t (32) = 1.008, p = .321, d = 0.36, or to the Red Cross, t (32) < 1, p = .858, d = 0.06 (see Figure 5).

4. General discussion

Anger and guilt feelings typically emerge from social contexts in which one individual breaks with socially shared expectations but they promote strikingly different behaviours to adjust with the unpleasant state (Haidt, 2003; Keltner, 1996; Tangney, Miller, Flicker, & Barlow, 1996). Anger and guilt promote actions that will restore compliance to the expectations by, for example, threatening or punishing a harm doer and making amend to the harmed person, respectively (Ausubel, 1955; Haidt, 2003). Those emotional influences on our social behaviour are likely to be mediated or accompanied by changes in the way we attend, perceive, judge, or empathize with a person. The study thus aimed at examining whether guilt and anger influence our ability to take someone's perspective and if so, whether they affect perspective by making us more or less self-centred or whether they affect more generally the cognitive control processes necessary to put aside our own perspective when it conflicts with the other person's perspective. Experiment 1 showed the expected effects of guilt and anger on prosocial behaviour but only as far as sharing with the person responsible for the emotion was concerned, and not when sharing involved a charity. Interestingly, Experiment 1 also showed that guilt made participants more other-oriented in a visual perspective-taking task while anger tended to make participants more self-centred. Guilt and anger had however no effect on the ability to handle conflicting perspectives. Experiment 2 aimed at ruling out that the observed effects of guilt were due to the feelings of shame and self-incompetence, two feelings concomitantly induced as a result of our guilt induction procedure in Experiment 1. Self-incompetence and shame had no effect on the sharing of raffle tickets and did not make participants more other-oriented in the visual perspective-taking task. Interestingly however, self-incompetence and shame affected participants' ability to handle conflicting perspectives. The implications of these findings for understanding the effects of emotional states on perspective taking and prosocial behaviour are discussed in turns.

4.1 The effects of emotional state on perspective taking

Experiment 1 showed that when participants were induced to feel guilt, they were more other-centred, showing better abilities in judging their partner's perspective than their own perspective. However, feeling guilt did not affect the ease with which participants dealt with conflicting perspectives. Thus, in line with previous findings (Yang et al., 2010), our results indicate that guilt affects perspective taking but here, we can conclude in addition that guilt affects the orientation of attention to the other person and not the cognitive resources required to inhibit one's own perspective.

Interestingly, the visual perspective-taking task that we used does not only include deliberative perspective-taking processes (explicit perspective attribution) but also low-level processes (the attraction of visual attention to the other person and attentional reorienting to the object that the other person is looking at; Ramsey et al., 2013; Samson et al., 2010). Previous effects of guilt on perspective taking were found in a verbal task in which visual attentional processes were not recruited (Yang et al., 2010). Accordingly, either the other-centred effect occurs only at the stage of deliberative perspective taking or it occurs also at the stage of more low-level processes. It would be an interesting avenue to explore further this latter possibility.

It is important to highlight that this other-centred effect on attention does not directly speak to the other- and self-centred nature of the motives of the reparative actions that people feeling guilt engage in. The other-centred effect on attention concurs with the relationship-oriented goals that guilt promote (i.e., willingness to repair a damaged relationship due to a faulty action; Baumeister et al., 1994) but does not exclude that these goals are fuelled by selfish motives to reduce the unpleasantness of guilt.

Although we described the effect of guilt on perspective taking as an other-centred advantage, it can also be described as a self-centred disadvantage. However, an increased self-centred disadvantage could also originate from increased attention on the partner's perspective because it would increase the difficulty of disengaging from the partner's perspective in self-perspective trials. Alternatively, guilt may not orient attention to the partner's perspective but rather draw attention away from our egocentric perspective; this phenomenon has never been described but could be related to the escape of self-awareness described in pathological populations such as suicide attempters, in which a strong feeling of guilt is often present (e.g., Baumeister, 1990).

Guilt and shame often co-occur and this was the case in Experiment 1. Indeed, as part of our guilt induction procedure, participants were led to believe that they performed very badly and they could not reciprocate the wins they received as a result of the good performance of their partner. This procedure did not only induce guilt but also a feeling of low self-competence and a feeling of shame. It was thus possible that the effects observed in Experiment 1 and attributed to guilt were in fact the result of feelings of shame and/or self-incompetence. In line with this concern, the replication experiment of the guilt condition confirmed that participants felt high feelings of self-incompetence and shame (see Appendix 3). In Experiment 2, we thus examined the effects of shame/self-incompetence by using an induction procedure that specifically targeted these feelings. Two interesting results were found. Firstly, when participants felt shame and self-incompetence, there was no other-oriented advantage anymore in the visual perspective-taking task (see Figure 4(a)) nor was there any effect on the prosocial behaviour measure (see Figure 5). This indicates that the effects observed in Experiment 1 were due to guilt rather than to the feelings of shame and self-incompetence. Secondly, although shame and self-incompetence did not make participants more other-oriented, these emotions did nevertheless impact on the performance on the visual perspective task by making participants less able to handle conflicting perspectives (see Figure 4(b)). Our results are in line with those of Yang and colleagues (2010), who found that the participants in the shame condition were worse in taking the other person's perspective than those in the control condition. From our study, we can conclude in addition that shame (associated with low self-competence) affects the cognitive resources required to inhibit one's own perspective and not the orientation of attention to the other person. Shame and self-incompetence seems thus to affect perspective taking through a different pathway than guilt.

The depletion of cognitive control resources found among the participants of the shame condition is probably caused by a combination of factors such as the need suppress their unpleasant feelings (supported by the action tendencies to avoid and shelter), the disruption caused by the emotional arousal (supported by the body sensations reported), or the situational appraisals of being incapacitated or powerless usually associated with shame (Baumeister et al., 1994; Lewis, 1971; Lynd, 1958; Wicker, Payne, & Morgan, 1983).

Importantly, in this study we induced shame by manipulating perceived self-competence. This was done purposely to match the nature of our induction procedure in Experiment 1. However, shame is not always associated or caused by feelings of self-incompetence. It can also result from moral violations or condemnations from others (Gausel & Leach, 2011) and a future avenue for research would be to examine whether these other forms of shame affect perspective taking in the same way.

Since high levels of shame were reported in the guilt condition, one can wonder whether there were additive effects of shame and guilt in the guilt condition. If we compare the perspective interference cost across the various conditions of Experiments 1 and 2 (see Figure 4(b)), it appears that participants in the guilt condition showed the second highest cost after those in the shame condition, although there was no statistically significant difference when comparing that cost to the cost in the anger and control condition. We could speculate that the effects of shame in the guilt conditions were attenuated because, at the same time, guilt made participants more other-oriented thereby reducing the demands in self-perspective-taking inhibition. Therefore, the effect of guilt may have been partially cancelling out the effect of shame.

As for anger, the results of Experiment 1 showed that when participants were induced to feel anger, they tended to be more self-oriented, showing marginally better abilities in judging their own perspective than their partner's perspective. However, this self-perspective advantage was not significantly different to the one found in the control condition. The effect size of the impact of anger on perspective taking (d = 0.35) is small and clearly inferior to (1) the effect sizes found in the studies that showed an effect of anger on cognition as reviewed by Lerner and Tiedens (2006; *Mdn* = 0.78, range: 0.47-2.25), (2) the effect size of the impact of anger on the raffle ticket sharing in this study (d = 0.79) and (3) the effect size of the impact of guilt and shame on perspective taking in this study (guilt in Experiment 1: d = 0.71; guilt in Replication experiment: d = 0.71; shame in Experiment 2: d = 0.87). Moreover, power analysis indicated that in order for an effect of anger of this size to be detected (80% chance) as significant at the 5% level, a sample of 260 participants (122 in the anger condition) would be required, which is 4 times the average sample size found in the studies reviewed by Lerner and Tiedens (2006; *Mdn* = 30, range: 14-85).

This small effect of anger may seem surprising given that effects of anger on cognition have been repeatedly found (for a review, see Lerner & Tiedens, 2006). Hence, one may question whether this small effect originates from methodological issues such as the level of intensity of anger induced or the number of participants. It is important to note that our participants in the anger condition felt on average a level of anger (M = 4, on a scale ranging from 0, meaning "Not at all", to 6, meaning "Strongly") superior or equal to almost all the anger induction experiments that have shown effects on cognition as reviewed by Lerner and Tiedens (2006; after conversion to a 0 to 6 scale: *Mdn* = 3.09, range: 1.68-5.4). Moreover, guilt and shame showed effects on perspective taking despite the fact that they had comparable levels of intensities (guilt in Experiment 1: M = 4.8; guilt in Replication experiment: M = 4.7; shame in Experiment 2: M = 3.35) and a similar number of participants. It seems thus that anger has a much smaller effect on our perspective-taking task than on other cognitive tasks and tasks measuring prosocial behaviour and, that anger has also a much smaller effect on our perspective-taking task than guilt and shame.

Behavioural reactions to anger are known to vary across individuals (Ceulemans, Kuppens, & Mechelen, 2012; Martin et al., 1999; Spielberger, Krasner, & Solomon, 1988). It may thus be that the smaller effect of anger results from a larger inter-individual variability in the effect of anger on perspective taking than what is observed with guilt or shame. This is, however, not the case either. For 75% of the participants in the anger condition, the difference between the other-perspective and self-perspective trials went in the direction of a self-perspective advantage. This percentage is similar to the percentage of participants showing an other-perspective advantage in the guilt conditions of Experiment 1 (70.6%) and the Replication experiment (73%).

Finally, a remaining possibility is that anger does affect cognition in several opposing directions that cancel out each other out in perspective-taking tasks. Since anger and happiness are known to promote the use of heuristics rather than elaborate processing (e.g., Bodenhausen, Sheppard, & Kramer, 1994; Tiedens & Linton, 2001), anger should increase tendencies to use the default egocentric perspective rather than engaging in effortful perspective taking, as it was found for happiness (Converse et al., 2008). However, anger arises from situational appraisals where an external agent is blamed and judged as responsible of an offense (Horberg, Oveis, & Keltner, 2011; C. a Smith & Ellsworth, 1985; Wallbot & Scherer, 1986), which is likely to orient attention towards the person who caused the anger. As a result, anger may concomitantly increase reliance on the egocentric perspective and orient attention towards the person who caused the anger, the two effects cancelling one another out. It would thus be interesting to test whether anger may further increase this self-perspective advantage when one has to take the perspective of an unrelated individual rather than the person who caused the anger.

4.2 The effects of emotional state on prosocial behaviour

In Experiment 1, we found an effect of the emotional state on participants' prosocial behaviours. When feeling anger, participants were less generous towards their partner than in the control condition whereas, when feeling guilt, participants were more generous towards their partner. These findings are in line with previous studies showing the antisocial and prosocial influences of anger and guilt, respectively (e.g., Ketelaar et al., 2003; Hopfensitz & Reuben, 2009).

It is striking that in Experiment 1 participants' prosocial behaviour was influenced only when this behaviour was oriented towards the person with whom they socially interacted and not towards a charity. This finding suggests that participants' emotional experience of anger and guilt conveyed effects that target specifically context-relevant agents. This observation is in line with two other studies (Cryder et al., 2012; De Hooge, Nelissen, Breugelmans, & Zeelenberg, 2011) which showed that participants in the guilt induction condition showed higher prosocial tendencies than those in the neutral condition, but only towards the person(s) towards whom they felt guilty. Interestingly, however, guilt-related prosocial behaviours have been reported also towards irrelevant agents, such as charities or unrelated individuals, but these studies induced incidental emotions (i.e., de-contextualized emotions such as after autobiographical recalls, listening to music, or watching movies), that is, when guilt was not oriented to one person specifically (e.g., de Hooge et al., 2007; Ketelaar et al., 2003; Regan, 1971). Consequently, it seems that integral emotions (i.e., contextualized emotions such as in this study) affect prosocial behaviour in a *target-specific* way whereas incidental emotions affect prosocial behaviour in a *target-unspecific* way.

In Experiment 2, participants in the shame/self-incompetence condition did not differ from those in the control condition in terms of the number of raffle tickets allocated to themselves, to their partner, or to the Red Cross. This finding suggests that the increased generosity towards the partner found in the guilt condition was not due to participants' shame or self-incompetence feelings. The absence of effect on prosocial behaviour in the shame condition is in line with the absence of effects found in de Hooge and colleagues (2007) and with the avoidance action tendencies associated with shame in this study and in previous studies (Gausel, Leach, Vignoles, & Brown, 2012; Keltner, 1996; Lindsay-Hartz, 1984; Scherer & Wallbott, 1994; Tangney et al., 1996). More recent findings (De Hooge et al., 2011; de Hooge, Zeelenberg, & Breugelmans, 2010; Gausel et al., 2012; Gausel & Leach, 2011; Hooge, Breugelmans, Zeelenberg, & De Hooge, 2008; Zaiser & Giner-Sorolla, 2013), however, suggest that shame can promote both avoidance and approach behaviours, including prosocial behaviours, in order to restore the damaged self-image. Following this logic, shame should have not influenced the raffle tickets sharing in our study since giving tickets to a partner would not restore the self-image of being incompetent at the Card Picking Game. Finally, it has also been proposed that whether shame originates from a deviation from moral or personal standards is also a critical factor determining the prosocial influence of shame: only "moral shame" would lead to prosocial actions (Allpress, 2011). The fact that all the moral expectations were removed from the induction procedure of Experiment 2 could thus be another reason why shame had no effect on prosocial behaviour in our study.

5. Conclusion

Guilt and anger are two negative emotions promoting distinct social behaviours (Haidt, 2003, Nesse & Ellsworth, 2006). Here we examined whether these emotions also influence how we represent and understand others' point of view. Previous studies found that our emotional state can make us more or less egocentric. We examined this further by disentangling whether this results from a modulation of our cognitive control abilities (helping or hindering the inhibition of our own perspective) or whether it results more directly from a change in how much attention we allocate to ourselves and other people. While anger tended to make participants more self-oriented, guilt feelings clearly boosted participants' ability to take someone's perspective by making them more other-oriented. These two emotions had thus an effect on how attention is allocated to oneself and the other person rather than on the cognitive control abilities necessary to inhibit one's own perspective. This is however not the only way emotion can affect perspective taking. Feelings of shame and self-incompetence diminished participants' ability to take someone's perspective by reducing their cognitive control abilities. Our results thus highlight two different paths by which emotional states can affect perspective taking. Furthermore, our results suggest that anger and guilt, but not shame linked to self-incompetence, influence prosocial behaviour, specifically when the recipient of the action caused the participants' emotional state.

6. Appendix 1

6.1 Guilt replication experiment

6.1.1 Method.

Participants.

Eighteen individuals participated in the replication experiment, two participants did not feel guilt following the induction procedure and were thus replaced by an additional set of 2 participants who reported guilt feelings (9 females, mean age: 21.175, age range: 18-25). Participants participated in return of a 1/60 chance to win 150 euros and were also told that they would receive an additional monetary compensation which depended upon their partner's performance in a card game. The study was approved by the ethics committee of the Psychological Sciences Research Institute of the Université catholique de Louvain.

Material and procedure.

The participants followed exactly the same procedure as described in Experiment 1 for the guilt condition except that the confederate female was a different person.

6.1.2 Results.

Induction efficacy.

Two participants felt guilt below an intensity of 2 (on a scale ranging from 0, meaning "Not at all", to 6, meaning "Strongly") and were thus replaced with an additional set of 2 participants who felt guilt with an intensity of 2 or more.

Participants felt significantly more guilt, $M = 4.722$, $SD = 1.320$, than any other emotion (all *p*s $< .05$), except for attention, $t\ (17) = 1.158$, $p = .263$. Participants in the guilt condition of this experiment felt significantly more guilt and shame, $M = 3.611$, $SD = 2.033$, than the participants in the anger condition, respectively, $t\ (32) = 11.849$, $p < .001$, $t\ (32) = 3.273$, $p = .003$, and the control condition, $t\ (34) = 14.768$, $p < .001$, $t\ (32) = 7.370$, $p < .001$, but no more than those in the guilt condition of Experiment 1, $t\ (33) < 1$, $p = .803$, $t\ (32) < 1$, $p = .803$, respectively. Moreover, they perceived themselves as less competent than their partner, $t\ (17) = 18.647$, $p < .001$.

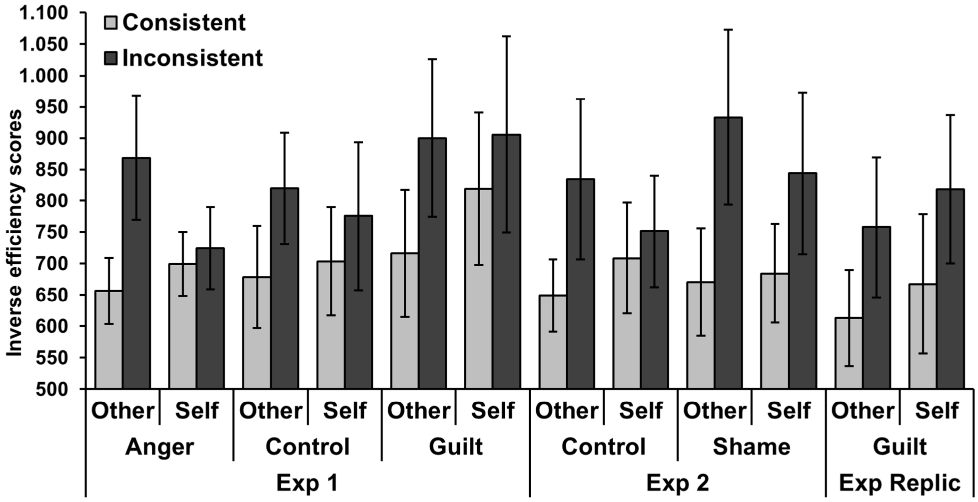
Participants felt significantly more body sensations (heart beating faster; tightness in the chest; lump in the throat; breath changes; burning cheeks; hot flush; perspiring; less relaxation) and action tendencies (yell, scream, or swear; disappear or dissolve; being paralyzed; shelter or protect oneself; less willing to sing, dance, jump, or laugh) than participants in the control condition of Experiment 1, indicating that the manipulation succeeded in inducing emotional "responses".

As for the credibility of the experiment, the ratings could go from 0, meaning 'Not at all convincing', to 6, meaning 'Strongly convincing', and averaged above 5.10 across all deceptive components.

In summary, the induction of guilt was overall successful and was rated as highly credible.

Visual perspective-taking task.

For the purpose of between-subjects comparison and because the mean ER was below .10, the ANOVA 2 (Perspective) x 2 (Consistency) was conducted on the IES. The analysis revealed a significant main effect of Consistency, F (1, 17) = 41.362, MSE = 393,913, p < .001, η_p^2 = .709, a main effect of Perspective, F (1, 17) = 9.531, MSE = 59,493, p = .007, η_p^2 = .359, with participants being better in judging from their partner's perspective than their own perspective, but a non-significant Consistency x Perspective interaction effect, F (1, 17) < 1, MSE = 190, p = .858, η_p^2 = .002. This unusual main effect of Perspective is in line with the effect of guilt found in the guilt condition of Experiment 1 (see Supplementary Figure 1). Planned contrasts comparing the other-perspective advantage (i.e., mean IES on self-perspective trials minus mean IES on other perspective trials) of the replication experiment with the other-perspective advantage in the three conditions of Experiment 1 revealed no difference with the guilt condition, t (65) < 1, p = .930, d = 0.03, but a higher other-perspective advantage compared to the control condition, t (65) = 2.066, p = .043, d = 0.71, and anger condition, t (65) = 3.051, p = .003, d = 1.08. In sum, the other-perspective advantage found in the guilt condition of Experiment 1 was replicated.



Supplementary Figure 1. Mean IESs in the visual perspective-taking task as a function of Experiment, including the Guilt replication Experiment, Perspective, Consistency, and Emotion conditions. Error bars represent 95% confidence intervals.

7. Supplementary information

7.1 Implementation of the Card Picking Game

Matlab 7.5 (The MathWorks Inc., Natick, Massachusetts, USA) with Psychtoolbox (Brainard, 1997) and Cogent (John Romaya, The Wellcome Department of Imaging Neuroscience, University College London, London, UK; http://www.vislab.ucl.ac.uk/Cogent/index.html) were used to present the Card Picking Game. The game interface comprised the monetary reserves of each player on the left side. A red superior panel and a blue inferior panel displayed the accumulated money of the fictive partner and the participant, respectively. A nickname chosen by the participant plus a portrait picture of each player were included in their respective panel to insure correct identification of each monetary reserve. Written statements displayed adjacently to each player's portrait described each player's current action (i.e. "[nickname] is watching" or "[nickname] is playing").

The game was divided in 16 rounds where each player played 8 rounds successively. The sequence of events of each trial was as follows. First a fixation cross appeared for 5-10 s followed by a reminder of each player's role and the current round count displayed for 3 s. Then, alongside a 5 s countdown, the two cards appeared in the centre of the screen side by side and showed their value for 3 s. Then the two cards turned over and remained face down for 2 s. Then, the two cards started to move and crossed each other's path for 8 to 10 s before returning side by side to the centre of the screen, face down. Then the picture of a hand appeared on the screen, pointing in the direction of the middle of the screen and symbolizing the active player's hand. Participant were asked to press the left or right arrow on the keyboard to indicate whether they choose the left or the right card respectively, and the pointing hand moved towards the chosen card. Finally, when the pointing hand arrived in front of the chosen card, the two cards turned over and showed their value. Before starting the game, participants played a 2 round warm-up session to become familiar with the interface and the card shuffling.

7.2 Induction efficacy in Experiments 1 and 2

Table S1. List of items rated in the exit questionnaire

Feelings	Body sensations	Action tendencies	Person appraisals
To what extent did you feel …?	*To what extent did you feel …?*	*To what extent did you feel the willingness to…?*	*To what extent…?*
Happy, thrilled, blooming	Lump in throat	Go towards someone/thing	Your partner was fair
Sad, depressed, blue	Heart beating faster	Leave, avoid	Your partner was nice
Angry, annoyed,	Change in	Kick, beat, destroy,	Your partner was

outraged	breathing	bite	nice competent during the Card Picking Game*
Scared, afraid, frightened	Chest tightness	Yell, scream, swear	Were you competent during the Card Picking Game*
Disdainful, scornful	Stomach troubles	Badmouth	
Anxious, tensed, nervous	Perspiring	Sing, dance, laugh, jump	
Disgusted, repulsed	Hot flush	Move, twist and turn,	
Amused, joyful, cheerful	Feeling cold, shivering	Disappear, dissolve	
Surprised, stunned, astonished	Muscles tensing	Cry, sob	
Attentive, concentrating, alert	Trembling	Protect, shelter	
Ashamed, disgraced, humiliated	Relaxed	Bing paralysed, unable to react	
Guilty, blameworthy, responsible	Boiling		
	Feeling hot, cheeks burning		

Note: * Present in the replication experiment and Experiment 2 only.

7.2.1 Experiment 1.

In terms of body sensations, the participants in the anger condition felt significantly less relaxation, t (32) = -3.976, p < .001, and more tension in the muscles, t (32) = 2.569, p = .015, a lump in the throat, t (32) = 2.557, p = .016, a tightness in the chest, t (32) = 2.376, p = .024, and their heart beating faster, t (32) = 2.101, p = .044, than those in the control condition. The participants in the guilt condition felt significantly less relaxation, t (33) = -4.823, p < .001, and more a lump in the throat, t (33) = 3.331, p = .002, a tightness in the chest, t (33) = 3.174, p = .003, tension in the muscles, t (33) = 3.047, p = .005, their heart beating faster, t (33) = 2.448, p = .020, sensations of boiling, t (33) = 2.315, p = .027, and breath changes, t (33) = 2.197, p = .035, than those in the control condition.

In terms of action tendencies, the participants in the anger condition were significantly less willing to sing, dance, jump, or laugh, t (32) = -3.221, p = .003, and to move, t (32) = -2.137, p = .040, but more willing to badmouth, t (32) = 2.996, p = .005, to go towards someone or something, t (32) = 2.806, p = .008, to kick, hit, or destroy, t (32) = 2.700, p = .011, to yell, scream, or swear, t (32) = 2.273, p = .030, and to feel paralyzed, t (32) = 2.218, p = .034, than those in the control condition. The participants in the guilt condition were significantly more willing to go towards someone or something, t (33) = 3.692, p = .001, and to disappear or dissolve, t (33) = 3.332, p = .002, than those in the control condition. Altogether, these results suggest that the participants in the guilt and anger conditions felt a series of body sensations and actions tendencies to a greater extent than those in the control condition, which indicates that the emotional induction succeeded in inducing emotional “responses”

7.2.2 Experiment 2.

In terms of body sensations, the participants in the shame condition felt significantly more burning cheeks, t (32) = 2.209, p = .034, and heat, t (32) = 2.607, p = .014, than those in the control condition.

In terms of action tendencies, the participants in the shame condition were significantly more willing to avoid or leave, t (32) = 3.892, p < .001, to shelter or protect oneself, t (32) = 2.447, p = .020, to yell, scream, or swear, t (32) = 2.235, p = .033, than those in the control condition.

Altogether, these results suggest that the participants in shame condition felt a series of body sensations and actions tendencies to a greater extent than those in the control condition, which indicates that the emotional induction succeeded in inducing emotional “responses”.

Chapter 4

Narcissists do not lack perspective-taking abilities

Is narcissism an irremediable curse to interpersonal cognition and behaviour? It has been long supported that reduced empathic and perspective-taking abilities in narcissists lie at the heart of their interpersonal difficulties but so far only the Interpersonal Reactivity Index (Davis, 1980), a self-report questionnaire, has been used to support this association. This study examined narcissists' actual performance on a behavioural measure of perspective taking. One-hundred healthy adults completed a visual perspective-taking task along with self-report questionnaires measuring narcissism, perspective taking, empathy, depression, anxiety, mood, and machiavellism. We found that individuals scoring high on narcissism did not have poorer perspective taking performance than individuals scoring low on narcissism; they actually prioritized less their egocentric perspective. These results suggest that narcissists are either genuinely paying more attention to others' views than non-narcissists or have the ability to be good perspective-takers if they are given the appropriate motives to be so. This reduced egocentrism was not explained by any measured factors other than narcissism. Based on these findings, we argue that narcissism has been negatively associated with self-reported perspective-taking habits because this latter measure actually captured narcissists' lack of communal motives in their interpersonal behaviour but not their actual perspective-taking abilities.

Narcissists do not lack perspective-taking abilities

Henryk Bukowski, Audrey Courtain, Dana Samson
Institut de recherche en sciences psychologiques, Université catholique de Louvain, Louvain-La-Neuve, Belgium

1. Introduction

A narcissistic person is characterized by inflated self-views, disregard for others' concerns, self-focus, and a strong need for external self-affirmation (American Psychiatric Association, 2000; Emmons, 1987; Morf & Rhodewalt, 2001). These features can be expressed to various extents, ranging from mildly expressed features in the normal population to excessively expressed features in some clinical populations. However, even at the sub-clinical level narcissism is associated with a wide range of interpersonal difficulties. For example, narcissists are less faithful and committed in their relationships (Campbell, Foster, & Finkel, 2002; Finkel, Campbell, Buffardi, Kumashiro, & Rusbult, 2009), react more aggressively to rejection or criticism (Bushman & Baumeister, 1998), are disliked by their peers (Back et al., 2013), and are more likely to commit crimes (Barry, Frick, Adler, & Grafeman, 2007; Hepper, Hart, Meek, Cisek, & Sedikides, 2014).

Reduced empathic (i.e., failing to share other people's feelings) and reduced perspective taking (i.e., failing to consider and understand other people's mental states) abilities have been proposed to lie at the heart of narcissists' interpersonal difficulties (Hepper, Hart, Meek, et al., 2014; Morf & Rhodewalt, 2001; P J Watson, Grisham, Trotter, & Biderman, 1984; P J Watson & Morris, 1991). This view is strongly supported by the consistent finding of a negative association between narcissism and perspective taking and empathy (Delič et al., 2011; Given-Wilson, McIlwain, & Warburton, 2011; Hepper, Hart, Meek, et al., 2014; Jonason & Krause, 2013; Munro, Bore, & Powis, 2005; Ritter et al., 2011; Vonk, Zeigler-hill, Mayhew, & Mercer, 2013; P J Watson et al., 1984; P J Watson, Little, Sawrie, & Biderman, 1992; P J Watson, Biderman, & Sawrie, 1994; P J Watson & Biderman, 1994; P J Watson & Morris, 1991). However, all these studies used the Interpersonal Reactivity Index (Davis, 1980), a self-report questionnaire of perspective taking and empathic habits and tendencies rather than actual behavioural performance. It is therefore likely that these studies highlighted narcissists' lack of motivation in taking other people's point of view but it is unclear whether narcissists have reduced abilities to accurately take other people's point of view. Following this logic, it is possible that narcissists are equally good at perspective taking than non-narcissists or that they can be equally good if they are given the right motives. This latter possibility received support from three recent studies that showed that narcissists' interpersonal performances can be improved if they are given the appropriate motives to perform better. More specifically, increased empathy was found following explicit instruction to imagine what another person is feeling (Hepper, Hart, & Sedikides, 2014), increased mimicry was found when interacting with a high status person relatively to low-status person (Ashton-James & Levordashka, 2013), and increased relationship commitment was found following the priming of communal values (e.g., caring, helpfulness; Finkel et al., 2009). These findings suggest therefore that narcissists' interpersonal abilities are less impaired than previously thought. However, no study has yet tested whether narcissists have poorer, identical, or better perspective-taking performance than non-narcissists.

This study aims to investigate the role of narcissism on behavioural performance in a perspective-taking task and to examine which underpinning mechanism of perspective taking might be related to narcissism: Do narcissists have different abilities to inhibit their interfering egocentric perspective or do they give a different attentional priority to their egocentric perspective relative to other people's perspectives?

Concerning the extent narcissists prioritize the processing of their egocentric perspective, several researchers described narcissists as egocentric individuals (Akhtar & Thomson, 1982; Dimaggio et al., 2002; Westen, 1990) because virtually all studies converge in pointing that narcissists are particularly self-interested and behave as if only their own person or image matters (e.g., Buss & Chiodo, 1991; for a review, see Morf & Rhodewalt, 2001). Alternatively, narcissists could put a high priority to others' views because of their chronic need to seek others' attention (Buss & Chiodo, 1991; Nathan DeWall, Buffardi, Bonser, & Keith Campbell, 2011), to validate their inflated self-views in the eyes of others (Morf & Rhodewalt, 2001), or to compare themselves with others (Campbell, Reeder, Sedikides, & Elliot, 2000). No study has yet objectively measured this dimension underpinning perspective taking.

As for the ability to inhibit a conflicting perspective, to this date, only one study has looked at the role of narcissism in individuals' abilities to inhibit interfering stimuli and reported no relation between narcissism and response inhibition (Unsworth et al., 2009). However, given that narcissism is often associated with proneness to shame and shame feelings (Gramzow & Tangney, 1992; P.J. Watson, Hickman, & Morris, 1996; Wright, O'Leary, & Balkin, 1989) and that previous studies have showed a negative impact of shame on perspective taking (Yang et al., 2010), and more specifically a negative impact on handling conflicting perspectives (cf. Chapter 3), it is possible that narcissists have reduced abilities to handle their conflicting egocentric perspectives.

In order to test whether narcissists have reduced perspective-taking abilities and to explore which specific mechanisms underpinning perspective taking may be affected, one-hundred participants were enrolled to complete a visual perspective-taking task (Samson et al., 2010). The task chosen was specifically designed to separately assess behavioural performance in terms of handling conflicting perspectives and in terms of the relative priority given to the egocentric perspective over another person's perspective. In addition, participants completed questionnaires measures of narcissism, empathy, perspective taking, mood, machiavellism, anxiety, and depression.

2. Method

2.1 Participants

One-hundred healthy adults (31 females, mean age: 22.52, age range: 19-26) participated in the study in return of 10 euros. Demographic information of 4 participants was not recorded due to a technical failure. The study was approved by the ethics committee of the Psychological Sciences Research Institute of the Université catholique de Louvain.

2.2 Stimuli and Procedure

After completing the consent forms, participants completed the Positive and Negative Affects Scale (PANAS; D. Watson & Clark, 1988) to assess their initial mood state. Then, they read the instructions related to a visual perspective-taking (VPT) task designed by Samson et al. (2010) and completed the task. Before being debriefed, participants completed four questionnaires: the Narcissistic Personality Inventory (NPI; Raskin & Terry, 1988), the Interpersonal Reactivity Index (IRI; Davis, 1980), the Mach-IV inventory (Christie & Geis, 1970), the State and Trait Anxiety Inventory (STAI; Spielberger, 1983), and the Beck Depression Inventory (BDI; Beck, 1961), which assess narcissism, empathic and perspective-taking habits, machiavellism, anxiety, and depression, respectively.

The PANAS is a self-report questionnaire using a 5-point intensity scale ranging from “Not at all or very slightly” to “Strongly” on 10 positively and 10 negatively valenced emotional states (D. Watson & Clark, 1988). The initial emotional state of participants was assessed because it has been shown to influence both empathy and perspective taking (Converse et al., 2008; Singer et al., 2006; Yang et al., 2010).

Narcissism was assessed with the NPI questionnaire in its classic form with 40 items (Raskin & Terry, 1988) on which participants had to rate their extent of agreement on a 7-point Likert scale ranging from “Strongly disagree” to “Strongly agree”. Scores on the NPI have consistently been negatively associated with empathy and perspective taking (e.g., Delič et al., 2011; Hepper, Hart, Meek, et al., 2014; Jonason & Krause, 2013; P J Watson et al., 1984).

Empathy and perspective taking were assessed with the IRI (Davis, 1983), a self-report questionnaire composed of 28 statements about their personal experiences and habits in social and emotional situations on which participants had to rate their extent of agreement on a 5-point Likert scale ranging from “Strongly disagree” to “Strongly agree”. The IRI is divided in 4 subscales: perspective taking, fantasy (i.e. self-absorption in fictions), empathic concern, and personal distress. The perspective-taking and empathic concerns subscales reflect respectively cognitive and affective empathy habits.

The MACH-IV (Christie & Geis, 1970) is a self-report questionnaire using a 7-point Likert scale ranging from “Totally disagree” to “Fully agree” on 20 different beliefs and habits statements. Machiavellism as a personality trait was assessed because it has been negatively associated with the Empathy Quotient (Ali & Chamorro-Premuzic, 2010), a self-report questionnaire measure of empathy (Baron-Cohen & Wheelwright, 2004) and because machiavellism has been linked to narcissism (e.g., Paulhus & Williams, 2002; Wai & Tiliopoulos, 2012) .

The STAI (Spielberger, 1983) is a self-report questionnaire using a 4-point frequency scale ranging from “Almost never” to “Almost always” on 20 trait-related and 20 state-related statements. Anxiety as personality trait and a state was assessed because it has been previously negatively associated with empathy (Davis & Oathout, 1992; Deardorff, Kendall, Finch Jr, & Sitarz, 1977; Negd, Mallan, & Lipp, 2011).

The BDI (Beck, 1961) is a self-report questionnaire containing 21 series of 4 statements among which participants must choose the one corresponding to their state in the past few weeks. Depression was assessed because a few studies have reported impaired empathy and perspective taking among clinically depressed individuals (Kerr, 2003; Lee, Harkness, Sabbagh, & Jacobson, 2005; Y. Wang, Chen, Zhu, & Wang, 2008; Wolkenstein, Schönenberg, Schirm, & Hautzinger, 2011).

The VPT task (Samson et al., 2010) is a behavioural measure of perspective-taking performance measured through mental chronometry. Participants were instructed to make judgments from either their own or someone else’s visual perspective in situations where both perspectives are either conflicting or consistent. More specifically, they were asked to judge whether a number prompt (ranging from 0 to 3) matches the number of discs visible from the prompted perspective, which could be either their own perspective (self-perspective condition) or the perspective of the person in the room (other-perspective condition). The other person and the participants could see either the same number of discs (consistent condition) or a different number of discs (inconsistent condition). Each trial was a sequence of a fixation cross, a 500 ms blank screen, a perspective prompt (‘SHE’/’HIM’ or ‘YOU’), a 500 ms blank screen, a number prompt (0/1/2/3), and a picture of a lateral view of a room in which a person was posited in the centre facing the left or the right wall with 0 to 3 red discs on it. The person in the centre of the room was an avatar of the same gender as the participant. The number prompt could match or mismatch the number of red discs visible from the prompted perspective. Participants had to press the upward arrow when the number prompt matched or the downward arrow when the number prompt mismatched. A feedback was presented after each response indicating whether the response was correct (‘CORRECT’ or ‘INCORRECT’) or when 2000 ms has elapsed (‘NO RESPONSE’). The perspective to adopt was manipulated so that the participant had to adopt equally often their own perspective or the avatar’s perspective (self-perspective vs.

other-perspective conditions). The consistency between perspectives was manipulated so that the participant and the avatar were seeing equally often either the same visual content or a different visual content (consistent vs. inconsistent perspectives conditions). Perspective and Consistency were orthogonally manipulated, forming 4 experimental conditions for statistical analyses. The task included a total of 128 trials, evenly spread across experimental conditions and divided into 2 blocks of 52 trials plus a set of 26 practice trials. Trials within each block were presented in a randomized order. To avoid anticipatory responses, 18 filler trials were included. Reaction times and errors were collected but only matching trials were taken into account for the analyses because the task difficulty between conditions was unbalanced in mismatching trials (for details, see the original study by Samson and colleagues, 2010).

The experiment was run on a Pentium 4 computer with a 17-inch monitor. The visual perspective-taking (VPT) task was programmed on E-Prime software (version 2.0, Psychology Software Tools) and all the questionnaires were presented via online forms implemented with Google Drive.

2.3 Data analyses

In order to insure that statistical conditions were met to investigate inter-individual differences in terms of narcissism, we inspected the distribution of participants' score on the NPI-40 questionnaire (see Figure 1) and noted that scores were normally distributed (Shapiro-Wilk: $p = 0.988$). In addition, the scale was highly reliable (40 items; $\alpha = .91$). To test the effect of narcissism on perspective-taking performance, we split our sample of participants into high and low narcissism groups (N = 49 vs. 50) based on the median NPI score (*Mdn* = 146). The NPI data of one participant was lost due a technical failure and was thus not included in analyses.

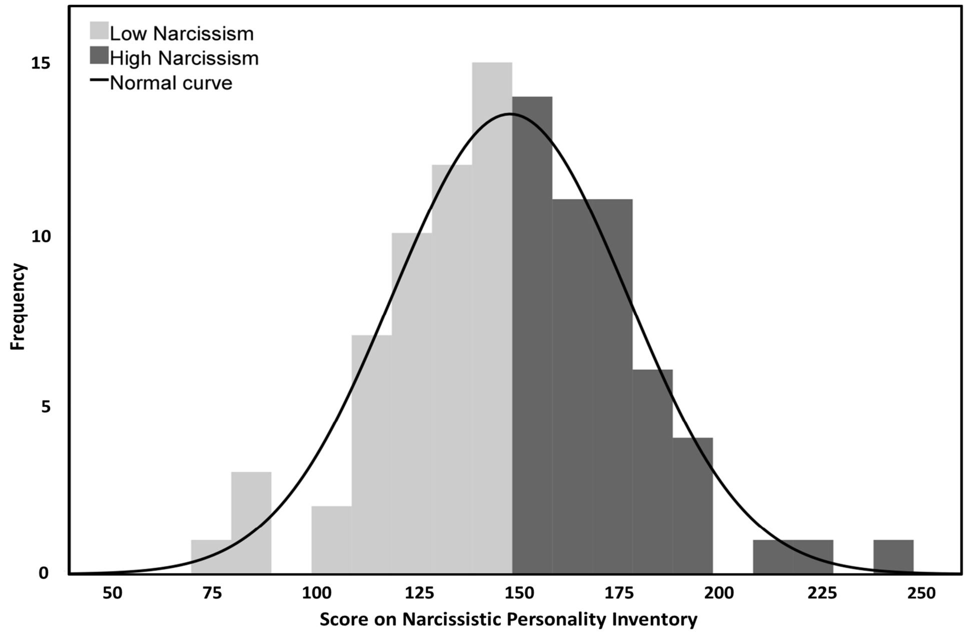


Figure 1. Histogram of participants' scores on the Narcissistic Personality Inventory (Raskin & Terry, 1988) split into low and high narcissism participants.

3. Results

3.1 Narcissism and perspective-taking performance

Trials on which participants responded beyond 2.5 standard deviations above or below the mean for each condition (1.08 % of all data) were excluded from statistical analyses. The results are presented separately for reaction times (RT) and error rates (ER). The RT data of one participant was lost due to a technical failure.

A 2 x 2 x 2 ANOVA was conducted on the RT and ER with the Consistency between the two perspectives (consistent vs. inconsistent perspectives) and the Perspective to judge (self- vs. other-perspective) as within-subject variables, and NPI (low NPI vs. high NPI) as a between-subjects variable.

3.1.1 Reaction times.

The ANOVA on RT revealed a significant main effect of Consistency, F (1, 96) = 136.199, MSE = 604,284, p < .001, η_p^2 = .587, a significant main effect of Perspective, F (1, 96) = 10.409, MSE = 50,833, p = .002, η_p^2 = .098, and a significant Consistency x Perspective interaction effect, F (1, 96) = 33.172, MSE = 165,042, p < .001, η_p^2 = .257. These results replicate all the effects found in the original study (Samson et al., 2010) and show that the task was properly completed.

Of particular interest to the current study were any effects of narcissism (see Figures 2 and 3). There was no main effect of NPI, F (1, 96) < 1, MSE = 5,686, p = .787, η_p^2 = .001, nor any significant interaction with NPI (NPI x Consistency: F (1, 96) < 1, MSE = 1, p = .990, η_p^2 = .001; NPI x Perspective, F (1, 96) < 1, MSE = 4,714, p = .328, η_p^2 = .010, see Figure 2; NPI x Consistency x Perspective: F (1, 96) < 1, MSE = 4,434, p = .348, η_p^2 = .009).

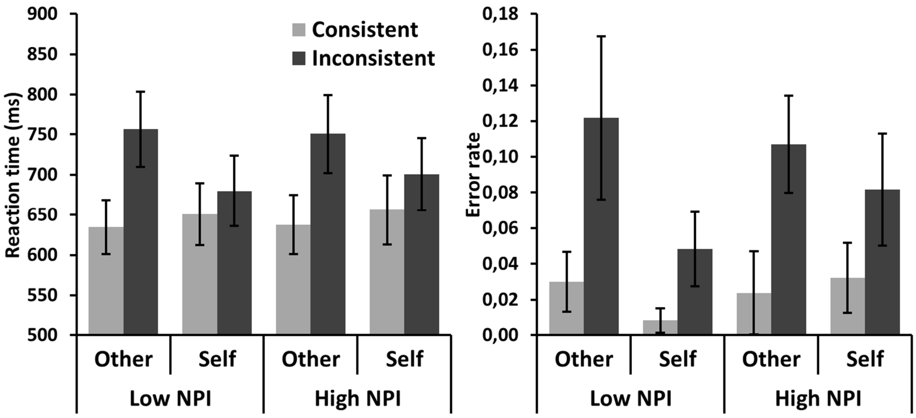


Figure 2. Mean RTs (left panel) and ERs (right panel) in the visual perspective-taking task as a function of the Perspective, Consistency, and Narcissism (NPI) conditions. Error bars represent 95% confidence intervals.

3.1.2 Error rates.

Response omissions due to the timeout procedure (> 2000 ms) were counted as errors. The ANOVA on ER revealed a significant main effect of Consistency, F (1, 97) = 60.677, MSE = .432, p < .001, ηp^2 = .385, a significant main effect of Perspective, F (1, 97) = 13.063, MSE = .078, p < .001, ηp^2 = .119, and a significant Consistency x Perspective interaction effect, F (1, 97) = 7.136, MSE = .045, p = .009, ηp^2 = .069. These results replicated all the effects found in the original study by Samson et al. (2010) and show that the task was properly completed.

Regarding the effects of narcissism (see Figure 2), there was no main effect of NPI, F (1, 97) < 1, MSE = .008, p = .476, η_p^2 = .005, but the NPI x Perspective interaction was significant, F (1, 97) = 6.334, MSE = .038, p = .013, η_p^2 = .061. The NPI x Consistency and NPI x Consistency x Perspective interactions were not significant, F (1, 97) < 1, MSE = .001, p = .977, η_p^2 = .001, F (1, 97) < 1, MSE = .002, p = .583, η_p^2 = .003, respectively.

To explore the Perspective x NPI interaction effect, we conducted separate paired-t tests for each NPI group to test the effect of Perspective. There was a significant effect of Perspective in the Low NPI group, t (49) = 3.389, p < .001, d = 0.54, with 5% less errors when Low NPI individuals made judgments about their egocentric relative to the other person's perspective, but no significant Perspective effect in the High NPI group, t (48) < 1, p = .363, d = 0.13. In order to compare the Perspective effects across the two NPI groups, a t-test for independent samples was conducted on the perspective differences (i.e., mean ER of self-perspective trials minus mean ER of other-perspective trials) with the NPI as a between-subjects variable (see Figure 3). A positive perspective difference indicated an advantage in judging the avatar's perspective whereas a negative difference indicated an advantage in judging one's own perspective. Participants of the Low NPI group had a significantly lower mean perspective difference, M = -4.75%, SD = 8.75, than those in the High NPI condition, M = -0.85%, SD = 6.48, t (97) = 2.517, p = .013, d = 0.51. These results indicate therefore that the participants who scored highly in narcissism were less egocentric than those who had a low score of narcissism (see Figure 2).

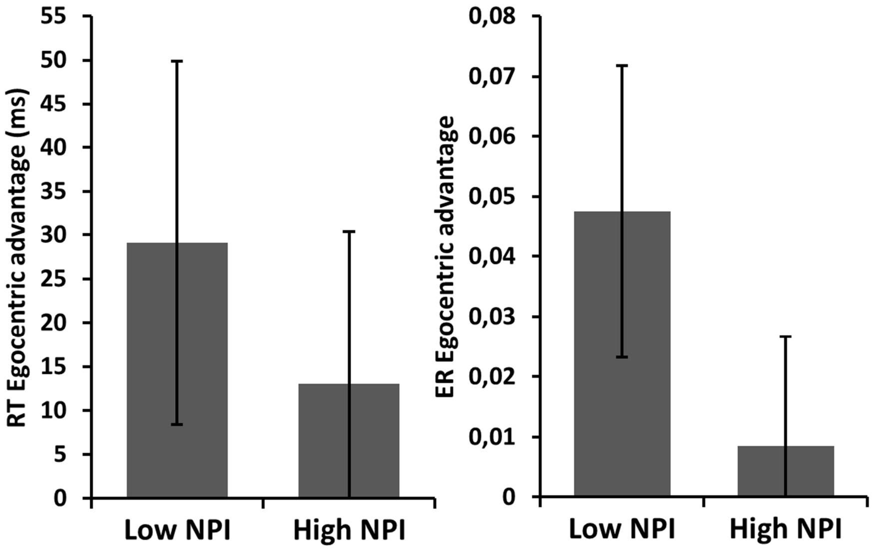


Figure 3. Performance advantage on self-perspective trials over other-perspective trials in the visual perspective-taking task on RTs (left panel) and ERs (right panel) as a function of the Narcissism group. Error bars represent 95% confidence intervals.

3.2 Correlations

As we were also interested in inspecting (1) whether the association between narcissism and perspective-taking performance was explained by other measured variables and (2) whether we would find again a negative association between narcissism and self-reported cognitive and affective empathy, we ran correlational analyses between participants scores of empathy and perspective taking (as measured by the perspective-taking and empathic concern subscales of the IRI and the VPT task) and their scores of narcissism (NPI), machiavellism (Mach-IV), depression (BDI), anxiety (STAI), positive affects (PA), and negative affects (NA).

Table 1. Correlations between the visual perspective-taking scores and the NPI as well as other trait and state measures.

N = 99	*NPI*	*IRI-PT*	*IRI-EC*	*Mach-IV*	*BDI*	*STAI*	*PA*	*NA*
Egocentric advantage (ER)	-,214*	-,159	,101	-,050	,041	,060	,001	,117
Egocentric advantage (RT)	-,066	,100	,126	-,058	,030	-,054	,094	,042
IRI-PT	-,125	1	,491**	-,282**	-,260**	-,310**	-,04	-,089
IRI-EC	-,246*	,491**	1	-,420**	-,062	,051	,077	,028

Note: NPI = Narcissistic Personality Inventory, IRI-PT and IRI-EC = Perspective-Taking and Empathic Concern subscales of the Interpersonal Reactivity Index, BDI = Beck Depression Inventory, STAI = State and Trait Anxiety Inventory, PA = Positive Affects, NA = Negative Affects, * = $p < .05$, ** = $p < .01$.

The participants' performance advantage in taking their egocentric perspective over another person's perspective was significantly negatively associated with the NPI score but was not significantly associated with any other questionnaire measures, which suggests that there is a linear relationship between narcissism and perspective-taking performance that could not be accounted for by other factors (see Figure 4).

The participants' scores on the perspective-taking and empathic concern subscales of the IRI were negatively associated with NPI scores, but this association was significant only for empathic concern, which replicates previous studies that consistently reported this negative relationship when using self-reports of everyday life habits.

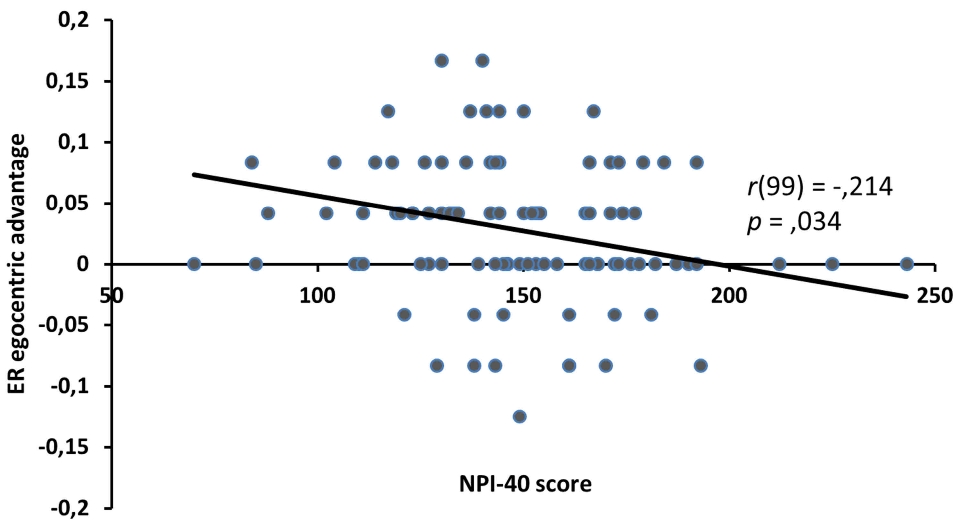


Figure 4. Performance advantage in self-perspective trials over other-perspective trials in the visual perspective-taking task on ERs as a function of the scores on the Narcissistic Personality Inventory questionnaire (NPI; Raskin & Terry, 1988).

4. Discussion

Even in the normal population, narcissism has been associated with interpersonal difficulties. Because self-reported empathic and perspective-taking habits were consistently negatively associated with narcissism, narcissists' difficulties in understanding and predicting other people's mental states may lie at the heart of their interpersonal difficulties. However, a recent study (Hepper, Hart, & Sedikides, 2014) provided evidence that narcissists have the *ability* to be as empathic as non-narcissists if explicitly instructed to be so. The current study aimed to test whether narcissists have lower perspective-taking abilities than non-narcissists while measuring empathic and perspective-taking habits. We found that participants scoring high on narcissism had not lower perspective-taking abilities than non-narcissistic participants and were actually less egocentric in their performance when judging what another person sees. This reduced egocentrism was not explained by any other measured factor than narcissism. Self-reported empathic habits and, to a lesser extent, perspective-taking habits, were nevertheless negatively associated with narcissism. The implications of these findings for understanding the effects of narcissism on perspective taking are discussed in turns.

We found that individuals scoring high on narcissism had not poorer perspective-taking performances than individuals scoring low on narcissism. This finding strongly supports the idea that narcissists have the ability to be as good perspective-takers as other individuals and is in line with recent findings that narcissists have the ability to express as much empathy (Hepper, Hart, & Sedikides, 2014), commitment in their relationship (Ashton-James & Levordashka, 2013) and mimicry behaviour (Finkel et al., 2009) as non-narcissists. However, our finding seems to contradict the behavioural results of Vonk and colleagues (2013) who reported a negative association between narcissism and social causal reasoning and theory of mind (i.e., the ability to impute mental states to others; Premack & Woodruff, 1978). This inconsistency is however probably explained by the fact that their measures did not entirely overlap with perspective-taking performance. Their scoring method of social causal reasoning included criteria irrelevant to perspective taking (i.e., descriptiveness of reasoning and immediacy of causal factors) and they used the Read the Mind in the Eyes Test (Baron-Cohen, Wheelwright, Hill, Raste, & Plumb, 2001) which taps more onto facial expression recognition and does not entail discrepant self-other perspectives.

Individuals scoring high on narcissism were not only unimpaired in perspective taking but they were actually *less* egocentric than individuals scoring low on narcissism in the sense that they gave less priority to the processing of what they saw over what other person saw. Individuals from the general population are reported as egocentrically biased in all perspective-taking tasks (e.g., Epley et al., 2004; Keysar et al., 2000; A. D. R. Surtees & Apperly, 2012), including in the VPT task (cf. Chapter 5). Hence, observing an absence of egocentric bias in a substantial sample of participants ($N = 49$) is an unusual finding. We interpret this finding as resulting from either situational or dispositional motivational factors specifically relevant to the narcissistic personality. The situational interpretation is that situational factors increased narcissists' motivations to perform well on the perspective-taking task. This interpretation is especially in line with three studies that showed superior performance among narcissists but only under conditions where motives for performing better were provided. More specifically, increased empathy was found following explicit instruction to imagine what another person is feeling (Hepper, Hart, & Sedikides, 2014), increased mimicry was found when interacting with a high status person (Ashton-James & Levordashka, 2013), and increased relationship commitment was found following the presence of communal goals (e.g., caring, helpfulness) in the partner or the priming of communal values (Finkel et al., 2009). Thus, it seems that narcissists can have good interpersonal performances if they are given the right motives. Following this interpretation, narcissists may be particularly motivated to self-enhance by succeeding the task at hand or to self-present positively to the experimenter. In line with this interpretation, narcissists outperformed non-narcissists in the VPT task only in terms of accuracy possibly because feedbacks on the accuracy of the participants' response were given after each trial.

The dispositional interpretation is that narcissists performed less egocentrically because they are genuinely motivated to pay attention to others. Congruently, narcissists are characterised for their chronic need to seek the attention of others (Buss & Chiodo, 1991; Nathan DeWall et al., 2011), for externally validating their inflated self-views (Morf & Rhodewalt, 2001), and for comparing themselves with others (Campbell et al., 2000). To fulfil these goals narcissists may therefore pay more attention to others than non-narcissists despite these goals are self-interested. This latter possibility would be in line with our finding that individuals induced in a state of guilt prior to completing the VPT task also gave a higher priority to another person's perspective than to their own perspective (cf. Chapter 3) despite the fact that guilt is considered as a self-interested and self-centred emotion (Iyer et al., 2003; Tracy & Robins, 2003).

Although we found a positive association between narcissism and perspective-taking performance, empathy and perspective taking have both been negatively associated with narcissism. These negative associations have been consistently reported with self-report questionnaire measures (Delič et al., 2011; Given-Wilson et al., 2011; Hepper, Hart, Meek, et al., 2014; Jonason & Krause, 2013; Munro et al., 2005; Ritter et al., 2011; Vonk et al., 2013; P J Watson et al., 1994, 1984, 1992; P J Watson & Biderman, 1994; P J Watson & Morris, 1991) but less so with behavioural measures (Hepper, Hart, & Sedikides, 2014; Vonk et al., 2013). One explanation reconciling these conflicting findings is that the IRI, the self-report questionnaire used so far, and the behavioural measures do not assess the same facet of perspective taking. The IRI assesses perspective taking by scoring agreements on statements such as "If I'm sure I'm right about something, I don't waste much time listening to other people's arguments.", "I try to look at everybody's side of a disagreement before I make a decision", and "I sometimes try to understand my friends better by imagining how things look from their perspective". It is thus implicitly assumed that people take other people's perspective because they care about others rather than for self-interested motives such as to manipulate others or to self-present positively. Consequently, the IRI assess to what extent narcissists adhere to communal values (e.g., caring, nurturance, warmth) whereas behavioural measures are more likely to assess actual abilities. Because it is well evidenced that narcissists adhere to agentic values (e.g., independence, ambition, assertiveness) rather than communal values (Campbell, Bosson, Goheen, Lakey, & Kernis, 2007; Campbell, Rudich, & Sedikides, 2002; Morf, Horvath, & Torchetti, 2011), it is not surprising that narcissists reported fewer perspective-taking habits if these habits are framed with communal values such as caring, equity, openness or friendliness. Interestingly, the sole study (Wai & Tiliopoulos, 2012) that reported a positive association between narcissism and perspective taking as measured through as self-report questionnaire is the only study that did not use the IRI but a perspective-taking subscale of the Empathy Quotient (Baron-Cohen & Wheelwright, 2004; Lawrence, Shaw, Baker, Baron-Cohen, & David, 2004). The items on this subscale are framed in terms of abilities rather than habits and are not framed with communal values (e.g., “I am good at predicting what someone will do.” or “I can easily work out what another person might want to talk about.”).

5. Conclusion

Is narcissism an irremediable curse to interpersonal cognition and behaviour? While it has been long supported that reduced empathic and perspective-taking abilities in narcissists lie at the heard of their interpersonal difficulties, this study showed that narcissists do not have poorer perspective-taking performances than non-narcissists. Moreover, we found that narcissists prioritized their egocentric perspective over another person’s perspective to a lesser extent than non-narcissists, which suggests that narcissists are either genuinely paying more attention to others’ views than non-narcissists or have the ability to be good perspective-takers if they are given the appropriate motives to be so. Finally, we argued that the repeatedly reported negative association between narcissism and perspective taking measured by a self-report questionnaire reflects narcissists’ lack of prosocial and communal motives in their interpersonal behaviour rather than a lack of interpersonal abilities.

Chapter 5

Beyond good versus poor perspective-takers: A two-dimensional approach to characterize perspective-taking performance

An individual's ability to take other people's perspective is usually graded along a one-dimensional continuum that allows characterizing individuals either as good or poor perspective-takers. This study tested whether inter-individual differences in perspective taking could be explained with two underpinning dimensions: The ability to handle the conflict between our egocentric perspective and another person's perspective and the relative priority given during processing to the egocentric perspective versus another person's perspective. We conducted cluster analyses on 346 participants who completed a visual perspective-taking task assessing performance on these two dimensions. Inter-individual differences were best reduced by forming 4 clusters, or profiles, of perspective-takers. This partition reflected a high heterogeneity along both dimensions. In addition, deconstructing the traditional one-dimensional measure of perspective-taking performance in two independent dimensions allowed to almost triple the explanatory power of perspective-taking performance in predicting participants' self-reported everyday life perspective-taking tendencies. Altogether, considering the priority given to the egocentric perspective versus another person's perspective as a potential source of variability allows forming, in combination with the ability to handle conflicting perspectives, a two-dimensional space that enriches our understanding of the inter-individual differences in perspective taking.

Beyond good versus poor perspective-takers: A two-dimensional approach to characterize perspective-taking performance

Henryk Bukowski, Dana Samson
Institut de recherche en sciences psychologiques, Université catholique de Louvain, Louvain-La-Neuve, Belgium

1. Introduction

Adults are not all equally good at taking someone else's perspective, that is to say, at inferring what another person is thinking, wanting or feeling. This ability is also referred to as Theory of Mind or cognitive empathy (to distinguish from affective empathy which consists in sharing another person's emotional experience (Premack & Woodruff, 1978; Preston & de Waal, 2002). Differences in perspective-taking skills among healthy adults have often been measured in relation to enduring, or trait-like, characteristics and have always been captured through a single score of perspective taking. For example, higher perspective-taking scores have been associated with higher self-esteem (Davis, 1983), better executive control (Brown-Schmidt, 2009; Wardlow, 2013), higher proneness to guilt (Joireman, 2004; Leith & Baumeister, 1998), better negotiation performance (Galinsky, Maddux, et al., 2008), and higher propensity to forgive (Rizkalla et al., 2008), whereas lower perspective-taking scores have been associated with higher proneness to anger (Mohr et al., 2007), higher dispositional hostility (Loudin et al., 2003; Richardson et al., 1994), narcissism (Delič et al., 2011; Hepper, Hart, & Sedikides, 2014), social dominance orientation (Pratto et al., 1994), alexithymia (Grynberg et al., 2010; Wastell & Taylor, 2002), or schizotypy (Langdon & Coltheart, 1999, 2001). In all these studies and in the study of perspective taking among healthy adults in general, it is implicitly assumed that individuals differ along a *one-dimensional* scale ranging from poor to good perspective-taking skills.

It is increasingly recognised, however, that perspective taking is not a unitary construct. Individuals' perspective-taking skills may thus vary along more than one dimension. We focus here on two dimensions directly linked to current views of the cognitive processes underlying perspective taking. The first dimension is probably the one that has been most studied so far and refers to the ability to handle conflicting perspectives. During our social interactions, we often hold a different view to that of others. Considering other people's point of view therefore often requires to suppress interferences from our own point of view (Birch & Bloom, 2004; Epley et al., 2004; Leslie, German, & Polizzi, 2005; Perner & Lang, 1999; Royzman et al., 2003), a computation that is thought to be achieved by domain general executive processes (Birch & Bloom, 2004; Leslie et al., 2005; Qureshi et al., 2010; Wardlow, 2013). Accordingly, it has been shown that perspective-taking performance decreases when individuals perform concurrently a task tapping onto executive processes (T. P. German & Hehman, 2006; Lin et al., 2010; Newton & de Villiers, 2007; Qureshi et al., 2010). Furthermore, it has been shown, both in children and adults, that perspective taking performance varies from one individual to another depending on the individual's performance in working memory and inhibitory control tasks (Bernstein, Atance, Meltzoff, & Loftus, 2013; Carlson, Moses, & Claxton, 2004; Carlson, Moses, & Hix, 1998; Carlson & Moses, 2001; Devine & Hughes, 2014; Fizke et al., 2014; Frye, Zelazo, & Palfai, 1995; Hughes & Ensor, 2007; Lin et al., 2010; Nilsen & Graham, 2009; Sabbagh et al., 2006; Wardlow, 2013). The ability to handle conflicting perspectives is thus one dimension along which individuals differ and which may determine individuals' overall perspective taking abilities. However, this may not be the sole dimension.

Another dimension along which individuals' perspective taking skills may vary relates to the relative priority that is given to our own point of view compared to other people's point of view during social interactions or when we think about others. It is often considered that our own perspective is more salient. For example, it is well known that objects associated with the self are preferred (Beggan, 1992), better attended to (Bargh, 1982; Sui, He, & Humphreys, 2012) and better remembered (Cunningham, Turk, Macdonald, & Macrae, 2008; Rogers, Kuiper, & Kirker, 1977). Several models also posit that we use our own point of view as anchoring point and then adjusted it when we think about other people's point of view (Epley et al., 2004; Gilovich & Savitsky, 1999). This explains why it can be so difficult to inhibit one's own conflicting perspective to consider other people's point of view and why, both in children and adult, egocentric biases are so prevalent in perspective taking tasks (Birch & Bloom, 2004; A. D. R. Surtees & Apperly, 2012).

Recent findings show, however, that the self-perspective is not necessarily more salient or getting in the way when children or adults watch or interact with other people. For example, there is accumulating evidence showing that, at least in some circumstances, we spontaneously track other people's mental states such as their beliefs (Kovács et al., 2010; Schneider, Nott, et al., 2014; van der Wel et al., 2014) or their visual experiences (Samson et al., 2010; Santiesteban et al., 2013) even when these mental states conflict with our own mental states. Such spontaneous tracking has been found to be maintained when individuals perform a concurrent effortful task (Qureshi et al., 2010), suggesting that attention can be drawn effortlessly to other people's mental states. The relative salience of one's own and someone else's perspective can thus be variable from one context to another but maybe also, in the same context, vary from one individual to another. Individual differences in perspective taking may therefore also be explained in terms of the priority that is given to the self-perspective relative to the other-perspective.

In order to test the hypothesis that inter-individual variability in perspective-taking performance can be better explained along two dimensions, namely the ability to handle conflicting perspectives and the relative priority given to the self- and the other-perspective, rather than one dimension, we used a visual perspective-taking (VPT) task developed by Samson and colleagues (2010). The task measures level 1 VPT, which is the ability to infer which objects someone else can or cannot see (in contrast to level 2 VPT that allows to infer that an object may have a different appearance to someone else; Flavell et al., 1981). In daily life, this basic form of VPT often serves as basis for more sophisticated inferences since what someone else is looking at gives us useful information about what that person wants, knows, thinks or talks about. Variability in performance on this VPT task is thus relevant for everyday life perspective taking.

More concretely, in the VPT task (see Figure 1), participants are shown a person in a room who is facing one of the lateral walls. Red dots are pinned on one or the two lateral walls. On some trials, some of the dots are not visible to the person in the room, which means that the person in the room does not see the same amount of dots as participants (inconsistent perspectives condition). On other trials, all dots are visible to the person in the room, which means that participants and the other person see the same amount of dots (consistent perspectives condition). Participants are asked either to judge the number of dots that they can see (self-perspective judgment) or they are asked to judge the number of dots the person in the room can see (other-perspective judgment). This task allows us to extract a classic measure of perspective taking, namely the performance in taking another person's perspective that is inconsistent with our egocentric perspective. This first measure corresponds to participants' performance in the other-perspective/inconsistent perspectives condition (see the dotted rectangle in Figure 1). Moreover, given the orthogonal manipulation of, on the one hand, the consistency of participants' perspective with the perspective of the person in the room and, on the other hand, the perspective to judge, we can separately measure (1) the ability to handle conflicting perspectives by comparing the performance on trials where the perspectives are inconsistent with the performance on trials where the perspectives are consistent, irrespective of the perspective that participants have to judge (Consistency index) and (2) the relative salience of the self- and the other-perspective during judgments by comparing the performance on trials where participants have to judge the other-perspective with the performance where participants have to judge the self-perspective irrespective of the level of conflict between the perspectives (Perspective index).

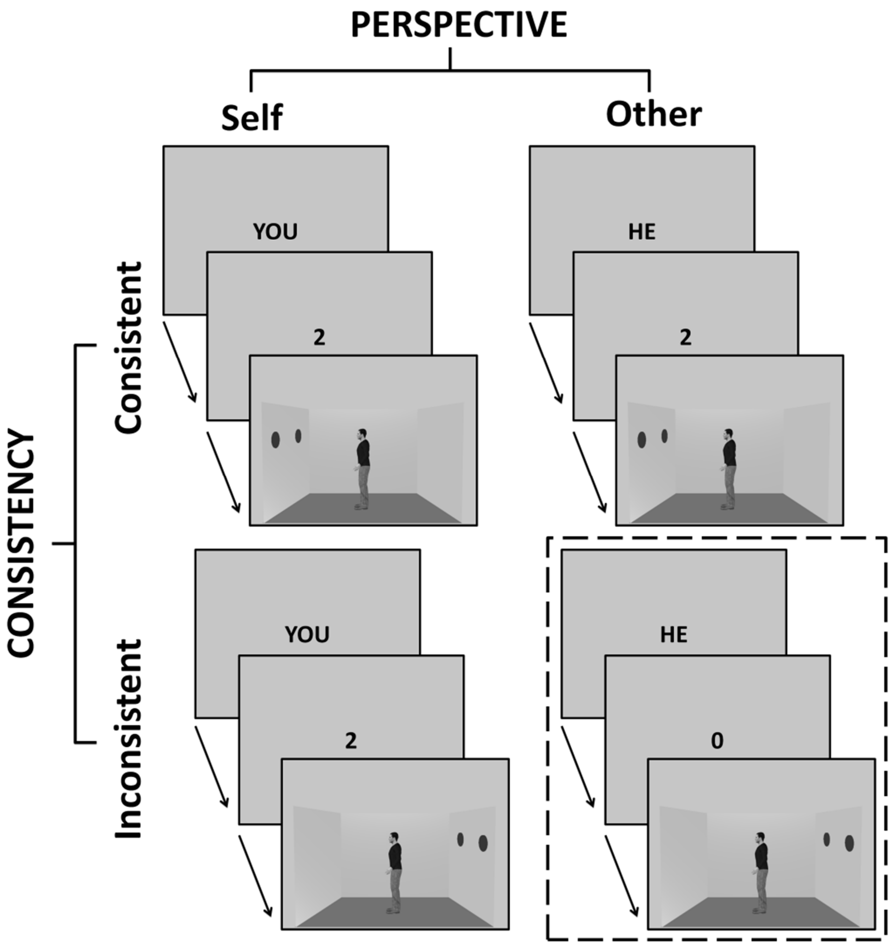


Figure 1. Examples of trials used in the VPT task in the different experimental conditions. Participants were asked to judge whether the number prompt (ranging from 0 to 3) matched the number of discs visible from the prompted perspective, which could be either their own perspective (self-perspective condition) or the perspective of the person in the room (other-perspective condition). The other person and the participants could see either the same number of discs (consistent condition) or a different number of discs (inconsistent condition). The classic one-dimensional measure of perspective taking is the ability to inhibit our egocentric perspective to correctly consider the other person's differing perspective, which was captured here by the performance in the other-perspective / inconsistent-perspectives condition (dotted rectangle). The two hypothesized dimensions, the handling of conflicting perspectives and the relative priority given to the self- versus other-perspective were measured by comparing performance on inconsistent and consistent perspectives trials (Consistency index) and on other- and self-perspective trials (Perspective index), respectively.

Based on these measures, we ran two separate cluster analyses that determine whether individuals can be partitioned in statistically distinct groups of perspective-takers. The first analysis was based on the one-dimensional measure while the second analysis was based on the two-dimensional measures. Depending on the number of subgroups obtained and how they differ from each other, we can determine how many dimensions are needed to distinguish the different groups of perspective-takers and whether considering the Consistency and Perspective measures separately gives us more information about the origin of the inter-individual variability than relying on a single and classic perspective taking measure. Participants also filled a self-reported questionnaire assessing perspective-taking skills so that we could also assess the extent to which the different clusters were useful in predicting everyday life perspective taking skills.

For the single dimension cluster analysis, two outcomes were possible: the cluster analysis could result either in one group, meaning that there were not enough individual differences to distinguish individuals in distinct groups (see Figure 2(a)), or several groups. This latter result would indicate that significant individual differences exist in our sample. However, these subgroups would be only distinguishable along a one-dimensional continuum, where some individuals could be classified as good perspective-takers and some others as poor perspective-takers (Figure 2 (b)).

If there is enough individual variability with the one-dimensional measure in our sample, we can then test whether these individual differences can be decomposed in distinct sources of variability, that is to say, in distinct dimensions along which individuals vary. For the two-dimensional cluster analysis, three outcomes were possible.

One possible outcome is that the different groups of perspective-takers can be fully distinguished along only one of the two measures introduced in the analyses, which would indicate that one of our measures does not reflect a dimension on which individuals vary. If this result is found, we would not be in a position to demonstrate that a two-dimensional assessment is more informative than a one-dimensional assessment. Given the evidence reviewed earlier, if only one of the two measures captures individual variability, it would most likely be the measure of Consistency which taps on individuals' ability to handle conflicting perspectives (see Figure 2(c)).

A second possibility is that the different groups of perspective-takers can be distinguished along both measures but in a highly similar fashion. For example, individuals with a high or low Consistency index would have, respectively, a high or low Perspective index. This high interdependence between the two indexes would indicate that the different groups can actually be fully distinguished with only one of the indexes or another dimension that summarizes the two indexes (see Figure 2(d)). Following such outcome, we would again be unable to demonstrate that a two-dimensional assessment is more informative than a one-dimensional assessment.

Finally, the third possibility is that the different groups of perspective-takers can be best distinguished when the two indexes are used (see Figure 2(e)). This would indicate that each index captures a unique extent of individual variability and that their combination can form a meaningful two-dimensional space which provides a better and richer assessment of inter-individual variability in perspective-taking performance.

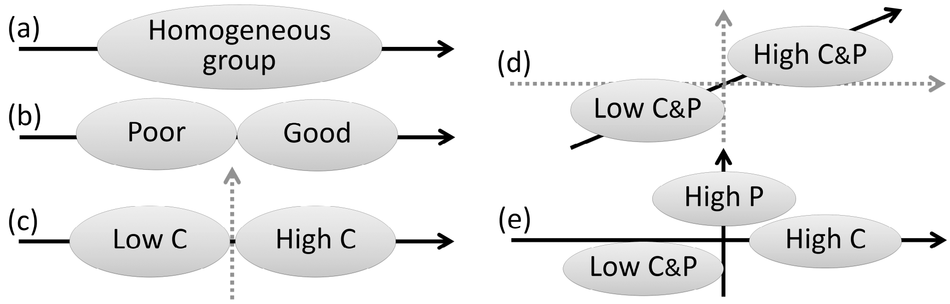


Figure 2. Five hypothetical outcomes regarding individuals' partition in distinct groups of perspective-takers and the minimum number of dimensions needed to distinguish them. Individuals could form (a) a homogeneous group or several groups that are distinguishable according to (b) the only one dimension considered, (c) only one of the two dimensions considered, (d) a single dimension unspecific to any of the two dimensions, (e) two dimensions. Black and grey arrows represent the hypothetical dimensions necessary and unnecessary, respectively, to distinguish the different groups of perspective-takers. C = Consistency index, P = Perspective index.

In order to run reliable cluster analyses, we needed a large sample of participants who had completed the VPT task. To this end, we merged the data sets from 6 different experiments to form a sample of 346 participants who all completed the VPT task (see Table 1). These experiments were presented in the two last chapters (except the experiments 4 and 5 that are briefly presented in the Appendix B) and thus included conditions in which emotional states (guilt, anger, shame, sadness and happiness) were induced. A few studies have started to highlight the impact of emotions on perspective-taking performance (Converse et al., 2008; Yang et al., 2010). The inclusion of these conditions thus reflects a natural source of variability in perspective taking that individuals can encounter over the course of a single day.

2. Method

2.1 Participants

We merged the data from 3 studies conducted in our research group totalising 6 experiments with a sample size of 346 healthy individuals (59% females, mean age: 21.5, age range: 18-33). The characteristics of the experiments are summarized in Table 1. All volunteers participated in return of course credits or 8 to 16 euros. Approximately half of the participants (N = 164) were in an emotion induction condition. All experiments were conducted at the Université catholique de Louvain and were approved by the ethics committee of the Psychological Sciences Research Institute.

Table 1. Description of the merged data set

Exp	*Conditions (N)*	*%F*	*M Age*	*Reference*
1	Guilt (17), Anger (16), Control (17)	52,9	21,5	Chapter 3
2	Guilt (18)	50,0	21,2	Chapter 3
3	Shame (17), Control (17)	55,9	21,0	Chapter 3
4	Sadness (19), Happiness (22), Control (21)	67,7	20,4	Appendix B
5	Sadness (30), Happiness (29), Control (29)	87,5	21,5	Appendix B
6	Control (93)	32,3	22,5	Chapter 4

2.2 Instruments

2.2.1 Visual perspective-taking task.

Perspective-taking performance was measured by the VPT task (Samson et al., 2010). Participants saw the picture of a room with a human model positioned in the centre and with red discs pinned one or both side walls (see Figure 1).The human model was shown sideways facing either the right or the left wall. Prior to the presentation of the visual scene, a perspective prompt indicating which perspective to take (“YOU” or “SHE”/“HE”) and a number prompt (ranging from 0 to 3) indicating a number of discs to verify were presented. Participants were asked to judge whether the number prompt matched the number of discs visible from either the participant’s perspective (self-perspective condition) or from the human model’s perspective (other-perspective condition) by pressing the upward arrow (yes) or downward arrow key (no). For example, after the prompts “HE” and “2”, participants had to judge whether the model could see two discs in front of him. The number of discs visible could be different between the two perspectives (inconsistent perspectives condition) or identical for both perspectives (consistent perspectives condition). Directly after the participant’s response, a feedback “Correct”, “Incorrect”, or “No response” was presented. A “No response” feedback was presented after 2 s had elapsed without a response from the participant. Errors and reaction times were collected. The task was run with the same timing of events as in the original study (see Samson et al., 2010, for a detailed description of the task) but with E-prime (Psychology Software Tools, Pittsburgh, PA, USA).

In Experiments 1, 2 and 3, like in the original paradigm, there were 24 matching trials and 24 mismatching trials in each of the 4 experimental conditions (2 (Perspective: self vs. other) x 2 (Consistency: consistent vs. inconsistent)). In addition, 16 filler trials were included to avoid anticipatory responses (see the original study for details). Furthermore, because mismatching trials in the consistent condition displayed number prompts irrelevant for any perspective and therefore were particularly easy to process, mismatching trials were unbalanced in terms of performance difficulty compared to matching trials and were thus not analysed. The task included a total of 234 trials divided into 4 blocks of 52 trials plus a set of 26 practice trials. Trials within each block were presented in a randomized order. In the Experiments 4, 5, and 6, we used a shortened version of the VPT task, with 2 blocks instead of 4, with which the findings of the original paradigm were replicated, suggesting that the shorter version was suited as well to measure VPT performance. The human model was a female confederate student in Experiment 1, 2, and 3, and a gender congruent human avatar in Experiments 4, 5, and 6.

2.2.2 Dispositional perspective taking.

We measured self-reported perspective-taking abilities with the Interpersonal Reactivity Index (IRI; Davis, 1980), a questionnaire measuring participants' agreement on a 5-point Likert scale with 28 statements about their habits, beliefs, and experiences in various social and emotional situations. The IRI is divided in 4 subscales: perspective taking, fantasy (i.e. self-absorption in fictions), empathic concern, and personal distress. For example, one of the seven items of the perspective-taking subscale states "I sometimes try to understand my friends better by imagining how things look from their perspective.". As we were specifically interested in measuring perspective taking, we only analysed the score on the perspective-taking subscale, labelled PT-IRI score, which could go from 0 to 28. The IRI was completed prior the emotion induction (when there was one) by all participants, except the participants of Experiment 4 who did not complete the IRI and one participant of Experiment 6 whose data was lost due to a technical failure. Overall, 283 participants completed the IRI.

2.3 Data analyses

2.3.1 Indexes computation.

In order to obtain normalized measures of one-dimensional and two-dimensional measures of perspective taking, we calculated 3 indexes: the Inc-Other index, the Perspective index, and the Consistency index. The Inc-Other index is a one-dimensional measure of, literally, the ability to consider another person's differing perspective, while the Consistency and the Perspective indexes measure the ability to handle conflicting perspectives and the relative salience of the self- versus the other person's perspective, respectively. To calculate these indexes, we first computed participants' reaction times (RT) for correct responses and error rates (ER) in the VPT task. To obtain a unique measure of performance (that cancels any potential speed-accuracy trade-off; Townsend & Ashby, 1978) for each index, we transformed RTs and ER in inverse efficiency scores (IES; mean RT divided by the proportion of correct responses).

The Inc-Other index was calculated from participants' IES in the other-perspective / inconsistent perspectives condition of the VPT task (see the dotted rectangle in Figure 1), with a higher value indicating lower (one-dimensional) perspective-taking performance. The Consistency index calculated from the subtraction of participants' IES in the consistent perspectives condition from their IES in the inconsistent perspectives condition, with a higher value indicating more difficulties in handling conflicting perspective. The

Perspective index calculated from the subtraction of participants' IES in the other-perspective condition from their IES in the self-perspective condition, with a positive value indicating better performance in taking the other person's perspective than the self-perspective. Finally, to normalize the 3 indexes in terms of unspecific global response speed, each index was divided by the participant's global IES (i.e., with all 4 conditions merged).

2.3.2 Cluster analyses.

In order to examine individual differences in perspective taking, we ran two two-steps cluster analyses: the first with the single index of perspective taking (the Inc-Other index) and the second with the Consistency and the Perspective indexes. Clustering consists in partitioning objects (here individuals) into groups that minimize within-group variability and maximize between-groups variability. Since this multivariate technique clusters individuals according to the source variables for which the highest variability is observed, we can then examine the dimensions that are necessary to explain performance variability. In other words, this technique combines the advantages of other structural techniques (e.g., principal component analysis, factor analysis) best suited for dimension reduction and those of functional techniques (e.g., multivariate regression, discriminant analysis) best suited to describe how these dimensions relate to the source variables (or predictors). The two-step technique consists in first forming small sub-clusters of individuals to reduce the size of the matrix and then progressively merging them following a hierarchical clustering algorithm. We chose this two-step technique because it offers the advantage that no arbitrary prescribed number of clusters is needed. The selected partition is the one that minimizes the Bayesian information criterion, a widely used statistical index for model selection that measures the efficiency of a model in predicting the data while penalizing the complexity of the model (Fraley & Raftery, 1998; Schwarz, 1978).

2.3.3 Regression analyses.

In order to examine whether self-reported abilities in everyday life activities can be better explained by a one-dimensional measure or two-dimensional measures, we compared two regressions analyses on the PT-IRI scores: One with Inc-Other index and gender for predictors, and the other with gender and the Consistency and the Perspective indexes as predictors.

2.3.4 Tests of independence.

We investigated whether the different profiles of perspective-takers obtained through the two-dimensional cluster analysis were equally distributed across (1) the different profiles obtained through the one-dimensional cluster analysis and (2) the different emotion induction conditions (control, guilt, sadness, shame, happiness, and anger). To do so, we ran two chi-square tests of independence between the two-dimensional cluster membership and either the one-dimensional membership or the emotion induction condition membership.

3. Results

3.1 One-dimensional cluster analysis.

The cluster analysis showed a 4-group partition based on 346 participants (see Table 2 for group centroid characteristics). This partition allows to distinguish individuals only along a one-dimensional continuum on which the 4 groups are characterized by either good (N = 92), average (N = 177), poor (N = 70), and very poor (N = 7) perspective-taking performance (see Figure 3(b)).

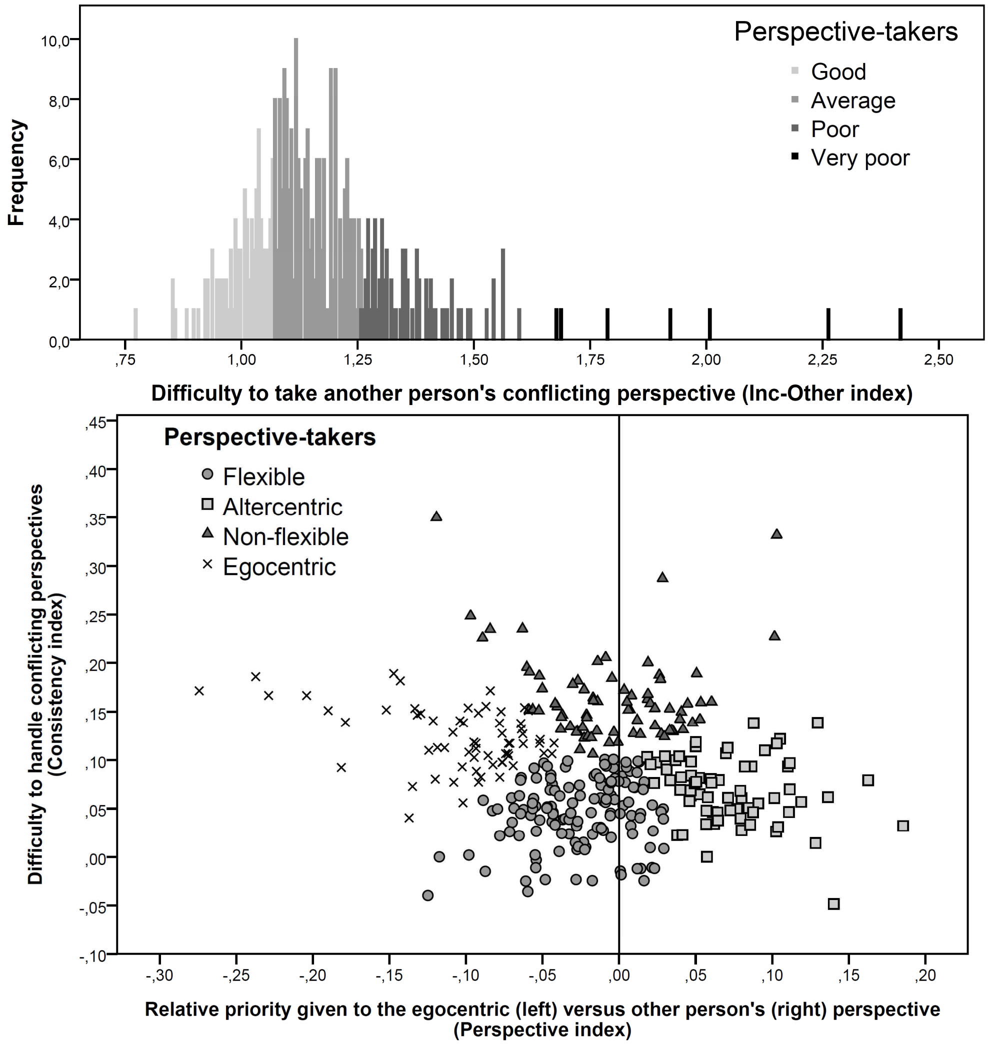


Figure 3. Upper panel: One-dimensional clustering of participants' difficulty in considering another person's differing perspective (Inc-Other index). Lower panel: Two-dimensional clustering of participants' perspective-taking performance based on their difficulty in handling conflicting perspectives (Consistency index) and the priority given to the other person's perspective versus the self-perspective (Perspective index).

3.2 Two-dimensional cluster analysis.

The cluster analysis showed a 4-group partition based on 346 participants (see Table 2 for group centroid characteristics and Figure 3 for the distribution of individuals according to the two dimensions). We can note that if we consider only the Consistency index, only two of the 4 groups can be distinguished. These two groups are characterized by having either high or low values on the Consistency index, which indicates that the two groups had particularly high or low difficulties in handling conflicting perspectives. We labelled these two groups as “non-flexible” and “flexible” perspective-takers, respectively. Critically, the two remaining groups are distinguished only along the Perspective index. They are characterized by having either highly negative or highly positive values on the Perspective index, which indicates that the two groups gave priority to either the self- or the other-perspective, respectively. We labelled these two groups as “egocentric” and “altercentric” perspective-takers, respectively. This result shows for the first time that there is a large amount of individual variability regarding the relative priority given to the egocentric versus the other people’s perspective[3] and that the priority is not given to the self-perspective in all individuals (20% show even the reverse). It is important to note however that, overall, individuals have a negative Perspective index (M = -.0161, SD = .067), which means that, in line with most perspective-taking studies, they are significantly better at taking their egocentric perspective over another person’s perspective, t (345) = 4.443, p < .001.[4]

Table 2. Description of the two cluster partitions based first on participants’ difficulty in considering another person’s differing perspective (Inc-Other) and, secondly, on both the difficulty in handling conflicting perspectives (Consistency) and the priority given to the other person’s perspective relative to the self-perspective (Perspective).

Source variables	**Inc-Other**			
Cluster #	1	2	3	4
Label	Average	Good	Poor	Very poor
N (% total)	177 (51.2%)	92 (26.6%)	70 (20.2%)	7 (2.0%)
Female %	71.4%	62.9%	56.5%	58.2%
Inc-Other *M* (*SD*)	1.153 (.055)	0.999 (.057)	1.367 (.885)	1.965 (.286)
Source variables	**Consistency**	**Perspective**		
Cluster #	1	2	3	4
Label	Flexible	Non-flexible	Altercentric	Egocentric
N (% total)	139 (40.2%)	75 (21.7%)	69 (19.9%)	63 (18.2%)
Female %	55.4%	62.7%	59.4%	61.9%
Consistency *M* (*SD*)	.046 (.034)	.164 (.045)	.069 (.034)	.122 (.032)
Perspective *M* (*SD*)	-.026 (.032)	-.005 (.042)	.073 (.036)	-.105 (.048)
Inc-Other *M* (*SD*)	1.12 (.076)	1.228 (.164)	1.006 (.078)	1.399 (.212)

[3] We found the same 4-group partition varying on both Consistency and Perspective indexes when we ran the two-step cluster analysis on the participants who were not in an emotion induction condition (see Appendix 1) or when we entered participants’ indexes of performance on the 4 experimental conditions (other/inconsistent, other/consistent, self/inconsistent, self/consistent) of the VPT task as source variables.

[4] We found the same egocentric advantage when taking into account only the participants who were not in an emotion induction condition, M = -.025, SD = .065, t (176) = 5.069, p < .001.

3.3 Predicting self-reported everyday life perspective-taking habits with a one-dimensional versus two-dimensional measures.

The regression analysis showed that the gender of participants did not significantly predict their PT-IRI scores, β = .020, *t* (282) < 1, *p* = .736, whereas their Inc-Other index marginally predicted their PT-IRI scores, β = -.107, *t* (282) = 1.803, *p* = .073. Together, these variables explained a non-significant proportion of the variance, R^2 = .012, *F* (2, 283) = 1.718, *p* = .181. In contrast, the combination of the Consistency and the Perspective indexes while controlling for gender explained a significant proportion of the variance, R^2 = .034, *F* (2, 283) = 3.286, *p* = .021. Participants' PT-IRI scores were not significantly predicted by participants' gender, β = .035, *t* (282) < 1, *p* = .560, nor their Consistency index, β = .026, *t* (282) < 1, *p* = .672. Participants' Perspective index, however, significantly predicted participants' PT-IRI scores, β = .186, *t* (282) = 3.107, *p* = .002.[5] In other words, the higher priority that individuals gave to the other person's perspective compared to their own perspective in the VPT task significantly predicted higher perspective-taking scores on the IRI questionnaire (see also Figure 4 for a comparison of perspective-taking scores across the 4 profiles of perspective-takers). Thus, deconstructing the one-dimensional measure into two independent dimensions allowed isolating a dimension that is more predictive of real-life perspective-taking habits than the traditional measure. Furthermore, entering the two dimensions as separate predictors had almost thrice the explanatory power of the one-dimensional model to predict self-reported perspective-taking habits.

[5] Entering the Perspective index x Consistency index interaction did not change the results (Model: R^2 = .035, *F* (2, 283) = 2.549, *p* = .040; Gender: β = .035, *t* (282) < 1, *p* = .562; Consistency index: β = .043, *t* (282) < 1, *p* = .521; Perspective index: β = .178, *t* (282) = 2.904, *p* = .004; Consistency index x Perspective index: β = .041, *t* (282) < 1, *p* = .548).

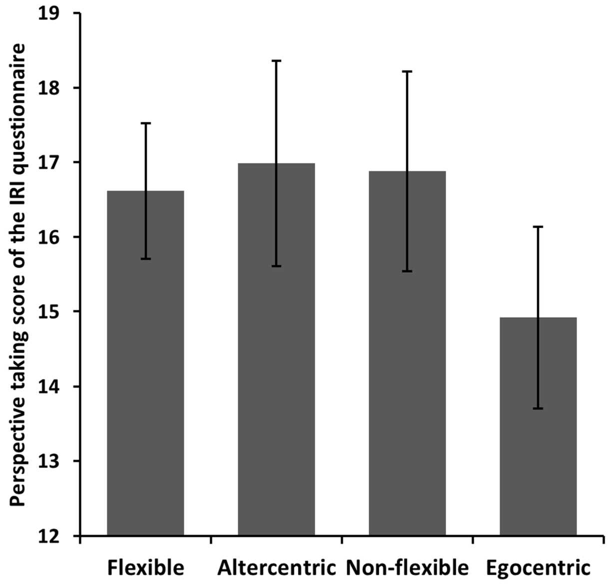
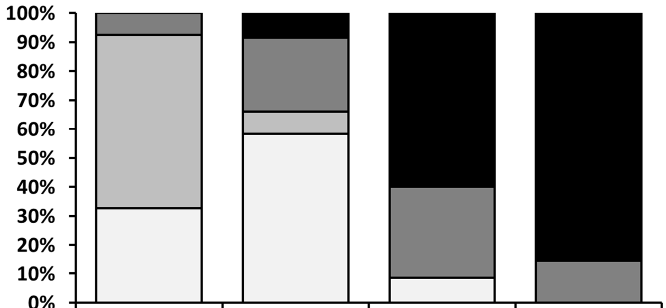


Figure 4. Perspective-taking scores measured by the IRI questionnaire in function of the groups of perspective takers. Error bars represent 95% confidence interval.

3.4 Comparison of the one-dimensional profiles and the two-dimensional profiles.

The Pearson's chi-square analysis revealed a highly significant rejection of the null hypothesis of independence between the one-dimensional ('good' to 'very poor' perspective-takers) and two-dimensional partitions of participants, $\chi^2(9, N = 346) = 260.680$, $p < 0.001$. When plotting how each profile of perspective-takers of the one-dimensional partition is distributed across each profile of perspective-takers of the two-dimensional partition (see Figure 5) we can note that the 2 partitions do not overlap. Instead, we can see that the 'good' perspective-takers profile can be broken down into individuals who either have low difficulties in handling conflicting perspectives or prioritize the other person's perspective over the self-perspective. As for the 'poor' perspective-takers, they can be broken down into individuals who either have high difficulties in handling conflicting perspectives or prioritize their egocentric perspective over the other person's perspective.

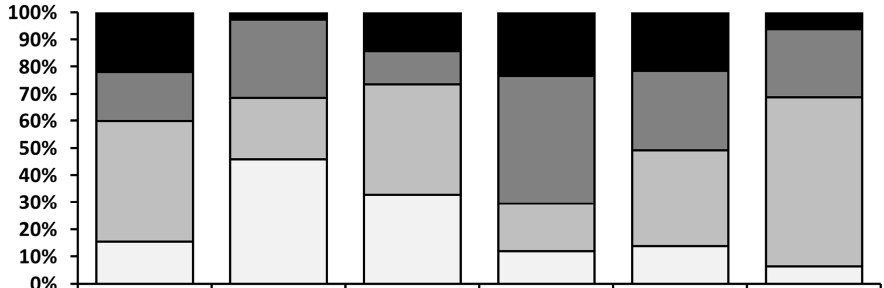


	Good (N = 92)	Average (N = 177)	Poor (N = 70)	Very poor (N = 7)
■ Egocentric	0,00%	8,50%	60,00%	85,70%
■ Non-flexible	7,60%	25,40%	31,40%	14,30%
■ Altercentric	59,80%	7,90%	0,00%	0,00%
□ Flexible	32,60%	58,20%	8,60%	0,00%

Figure 5. Distribution of the each profile of perspective-takers between the two-dimensional and one-dimensional partition.

3.5 Distribution of profiles across emotion induction conditions.

The Pearson's chi-square analysis revealed a highly significant rejection of the null hypothesis of independence in the distribution of each profile of perspective-takers across the different emotion induction conditions, $\chi^2(15, N = 345) = 47.066$, $p < 0.001$, which suggests that participants' perspective-taking performance can be highly influenced by transient factors such as their emotional state (see Figure 6). For example, while a sixth of the 177 participants included in a control condition was classified as non-flexible or altercentric perspective-takers, twice this proportion was found in the guilt and shame conditions, respectively (cf. Chapter 3).



	Control (N = 177)	Guilt (N = 35)	Sadness (N = 49)	Shame (N = 17)	Happiness (N = 51)	Anger (N = 16)
■ Egocentric	22,00%	2,90%	14,30%	23,50%	21,60%	6,30%
■ Non-Flexible	18,10%	28,60%	12,20%	47,10%	29,40%	25,00%
□ Flexible	44,60%	22,90%	40,80%	17,60%	35,30%	62,50%
□ Altercentric	15,30%	45,70%	32,70%	11,80%	13,70%	6,30%

Figure 6. Distribution of the two-dimensional profiles of perspective-takers within the emotion induction conditions.

4. Discussion

An individual’s performance on a perspective-taking task is usually graded along a one-dimensional continuum spanning from poor to good perspective-taking ability. This study showed, however, that inter-individual variability taken from a sample of 346 individuals could be better captured by taking into account two dimensions: the ability to handle conflicting perspectives and the relative priority that is given to the egocentric perspective versus other people’s perspectives. These two dimensions were not redundant in explaining inter-individual variability because individuals could score high or low on one dimension but not the other and, because the cluster division obtained by taking into account two dimensions did not overlap with the cluster division obtained with a classic one-dimensional perspective taking measure. Furthermore, we found that deconstructing the perspective-taking performance into two independent dimensions allowed to better predict individuals’ self-reported perspective-taking habits in daily life (as assessed with IRI questionnaire). This increased (almost tripled) predictive power came from the fact that, amongst the two dimensions, the relative priority that is given to the self- versus the other-perspective had a strong predictive power. This finding supports therefore that assessing the two dimensions separately allows testing and capturing effects that may have been not captured with a one-dimensional measure of PT performance.

Participants’ partition in two opposite groups regarding their ability to handle conflicting perspectives clearly indicates that there exists a large amount of individual variability on this dimension. Many studies have highlighted the role of domain general executive abilities in the ability to overcome the conflict between the egocentric perspective and another person’s perspective (Carlson et al., 2004; Qureshi et al., 2010). For example, young children or adults with frontal brain damage have poor performance on classic perspective-taking tasks but reducing the level of conflict between perspectives significantly increases their level of performance (Apperly, Samson, Chiavarino, Bickerton, & Humphreys, 2007; Apperly, Samson, & Humphreys, 2005; Carlson et al., 2002, 1998; Samson et al., 2005). Thus, given the known inter-individual variability observed on measures of domain general executive abilities it is not surprising to have found that the ability to handle conflicting perspectives is one dimension that explains individual differences in perspective-taking performance.

However, individuals' performance on executive tasks cannot entirely predict their performance on perspective-taking tasks (e.g., Carlson & Moses, 2001; Perner & Lang, 1999) and several studies in infants suggest that it is possible to correctly infer another person's conflicting perspective despite a reduced ability to handle conflicting perspectives (Kovács et al., 2010; Onishi & Baillargeon, 2005; Sodian et al., 2007; Surian et al., 2007). This is why we expected that at least an additional dimension must underpin perspective-taking performance.

Among the four groups of perspective-takers we obtained, only two could be distinguished in terms of difficulty in handling conflicting perspectives. The two other groups could be distinguished when another dimension was considered: the priority given to the egocentric perspective relatively to other people's perspective during processing. This means that there was enough variability along this dimension to form two opposite groups of perspective-takers. A fifth of our participants were characterized by a higher priority given to the other person's perspective than their egocentric perspective. This finding qualifies the widespread view that the egocentric perspective is always prioritized, accessed first, and used as an anchoring point during perspective taking (Birch & Bloom, 2004; Epley et al., 2004; Gilovich & Savitsky, 1999; Piaget & Inhelder, 1948; Ross et al., 1977), as for some individuals this was not the case. This finding is however consistent with recent studies showing that, in some situations, another person's perspective receives at least as much attention as the egocentric perspective. For example, holding a conflicting egocentric perspective did not prevent adults from spontaneously tracking other people's mental states (Kovács et al., 2010; Samson et al., 2010; Santiesteban et al., 2013; Schneider, Nott, et al., 2014; van der Wel et al., 2014), even when they concurrently performed an effortful executive task (Qureshi et al., 2010). Furthermore, some studies have shown that in the absence of conflict between perspectives adults judged faster what another person saw than what they saw from their egocentric perspective (Qureshi et al., 2010; Ramsey et al., 2013; Samson et al., 2010; Santiesteban et al., 2013; A. D. R. Surtees & Apperly, 2012). Together, these studies suggest that the egocentric perspective is not always as prioritized as usually assumed. In this study, we show for the first time that the extent of this prioritization differs across individuals and therefore that prioritizing our egocentric perspective should not be considered as a universal characteristic.

Together, the 4 groups, or profiles, of perspective-takers seem to reflect a high heterogeneity in the adult population where individuals with poor conflict handling skills and high egocentrism would have been otherwise merged into a single group of “poor” perspective-takers, and individuals with a high altercentrism and good conflict handling skills would have been merged into the “good” perspective-takers group (see Figure 4). Therefore, considering the priority given to the egocentric perspective versus the other person’s perspective as a potential source of variability allows to form, in combination with the ability to handle conflicting perspectives, a two-dimensional space that leads to a richer understanding of the underpinning causes of individual differences in perspective taking.

We found that self-reported perspective-taking tendencies in daily life were better predicted when using the two dimensions than using the one-dimensional measure of perspective-taking performance. Interestingly, perspective-taking tendencies were significantly predicted by participants’ priority given to the egocentric perspective relative to the other person’s perspective but not by their performances in handling conflicting perspectives. In addition, the participants characterized for highly prioritizing the self (i.e., egocentric group) were those who reported significantly less perspective-taking tendencies in their everyday life than all other groups of perspective-takers (see Figure 4). This finding is consistent with the fact that the IRI questionnaire measures only participants’ willingness to take other people’s perspective and thus captures motivational factors that are likely to determine their level of egocentrism but not their more domain-general conflict handling performance (cf. Chapter 4). Importantly, the fact that only one dimension predicted perspective-taking tendencies does not indicate that one dimension is enough to predict individual differences in perspective taking; the predictive value of the ability to handle conflicting perspectives has been largely documented when the ability rather than the motivation to take someone else’s perspective was measured (e.g., Carlson et al., 2004; Lin et al., 2010; Wardlow, 2013). Because the perspective taking subscale of the IRI (Davis, 1980) is geared towards the motivational aspects, it is possible that the Consistency index would be associated with scores on a real-life self-report measure of perspective taking if we had used another questionnaire, more geared toward actual abilities, such as the cognitive empathy subscale of the Empathy Quotient (Baron-Cohen & Wheelwright, 2004; Lawrence et al., 2004). In other words, there is no doubt that successful perspective taking in real life also depends on the ability to handle conflicting perspectives and so that the two dimensions are necessary. People have different knowledge and experiences of the world and therefore we must very often decentre from our prepotent vision of the world to correctly understand how others see the world.

Across the variety of emotion induction conditions participants were allocated to, we found very different proportions of egocentric, altercentric, non-flexible, and flexible perspective-takers. For example, we found a twice higher proportion of altercentric and non-flexible perspective-takers in the guilt and shame induction conditions, respectively, than in the control conditions. This finding suggests that our emotional state may affect our perspective-taking performance, which goes in line with the findings of Converse et al. (2008) and Yang et al. (2010) who reported a beneficial influence of sadness and guilt and a detrimental influence of shame and happiness. Because our emotions change over the course of a single day, this finding highlights the importance of considering perspective taking as a dynamic ability rather than a trait-like, or static, characteristic.

All our findings are based on a single task that measures level 1 VPT. This basic form of VPT has been proposed to be achieved via the computation of the other person’s line of sight and is considered as a building block of Theory of Mind development (Kessler & Rutherford, 2010; Michelon & Zacks, 2006; A. D. R. Surtees et al., 2013). However, one can wonder whether our findings generalize to the other forms of perspective taking (e.g., when beliefs or desires must be inferred) present in real life and in other perspective-taking tasks.

A first argument in favour of generalizability is that the same egocentric bias and the same relation to executive processes are found across verbal (auditory and visual) and non-verbal (visual and tactile) perspective-taking tasks that require to infer other people’s intentions (Keysar, 1994), knowledge (Camerer et al., 1989), beliefs (Carlson et al., 1998; T. P. German & Hehman, 2006; Newton & de Villiers, 2007), visual experiences (Keysar et al., 2000; Lin et al., 2010; Qureshi et al., 2010), and emotions (Gilovich et al., 1998; Silani, Lamm, Ruff, & Singer, 2013). This suggests that the same cognitive processes are involved irrespectively of the type of perspective-taking task used, including in level 1 VPT tasks.

Secondly, we found that participants’ relative priority given to the self- versus other-perspective significantly predicted participants’ self-reports of perspective-taking tendencies in their everyday life; which suggests that this new dimension we have highlighted reflects to some extent a real-life facet of perspective taking. It seems therefore reasonable to think that, although based on a measure of a simple form of perspective-taking, our findings generalize to perspective taking in real life and as studied on other tasks.

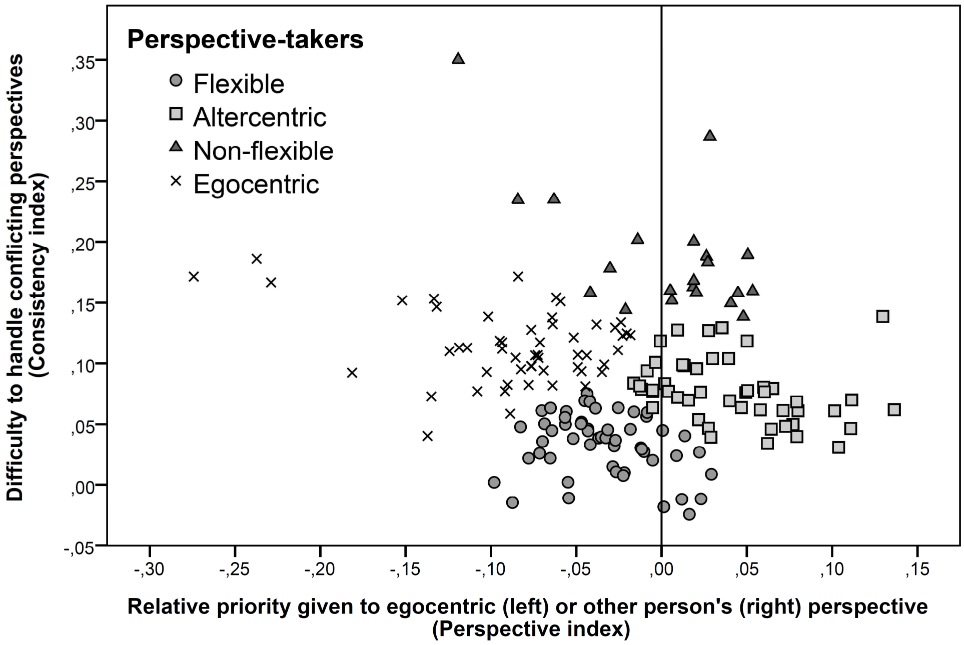
This study aimed to show the extent of potential individual variability within a relatively homogeneous population (i.e., university students) across diverse emotion conditions (see Figure 3) and control conditions (see Supplementary Figure 1). For this reason, our sample of participants is not, and was never meant to be, representative of the general population. Nevertheless, because the general population is much more heterogeneous, more inter-individual differences in perspective taking are expected in this population. We are therefore confident that the two-dimensional variability we reported here generalizes to the general population.

5. Conclusion

It is widely assumed that relying on our egocentric perspective is a universal prepotent tendency when inferring other people’s mental states, which led researchers to view perspective taking as resulting from the single ability to suppress or correct this egocentric tendency (Birch & Bloom, 2004; Epley et al., 2004; Leslie et al., 2005; Perner & Lang, 1999). This assumption is in line with the current assessment of perspective taking along a one-dimensional continuum spanning from poor to good perspective-taking performance.

We analysed the perspective-taking performance of 346 healthy adults on a task that separately assessed the relative priority given to the processing of the egocentric perspective versus the other person's perspective and the ability to handle conflicts between perspectives. We found a high heterogeneity along both factors that gave a richer account of the source of inter-individual differences than using a one-dimensional continuum. Perspective-takers that would classically be characterized as "good" perspective-takers were either individuals who efficiently handled conflicts or those who strongly prioritized the other person's perspective over their own perspective. On the other hand, perspective-takers that would classically be characterized as "poor" perspective-takers were individuals who had more difficulties in handling conflicting perspectives or those who strongly prioritized their egocentric perspective. Furthermore, while both the ability to handle conflicting perspectives and the priority given to the self versus others explained the variability on the perspective taking task, only the latter significantly predicted self-reported everyday life perspective taking ability. This study paves the way for a multidimensional approach in the study of inter-individual differences in perspective taking.

6. Appendix 1



Supplementary Figure 1. Two-dimensional clustering of participants allocated to the control conditions only based on their difficulty in handling conflicting perspectives (Consistency index) and their attentional priority given to the other person's perspective versus the self-perspective (Perspective index).

Chapter 6

Summary, discussion, & conclusion

Summary, discussion, & conclusion

1. Summary

This thesis aimed to challenge two traditional approaches in the study of perspective taking (PT) in healthy adults. The first traditional approach consists in considering PT as a static, or trait-like, ability and assessing it as such, that is, as if transient factors do not significantly affect PT performance. The second traditional approach consists in considering PT as a one-dimensional construct and assessing it as such, that is, on a one-dimensional scale on which individual variability is reduced to a poor-to-good performance continuum.

The empirical evidence reported in this thesis allowed us to make the following observations:

- PT is a dynamic ability in the sense that PT performance is not stable over time; Transient factors can significantly influence performance.
- PT is a multidimensional construct that is underpinned by at least two dimensions: the ability to handle conflicting perspectives and the relative attentional priority given to the processing of the egocentric perspective over the altercentric perspective.

These two observations are now discussed in turn.

1.1 Perspective taking is a dynamic ability

In Chapter 1 we have seen that because adulthood is considered as the end point of Theory of Mind (ToM) and PT development, it was implicitly assumed that adults should be flawless perspective-takers. Although adult PT performance was early on considered to reflect the adults' tendency to engage in PT rather than their actual abilities, PT tendencies were nevertheless studied almost exclusively in the context of inter-individual differences studies or as an independent variable manipulated through explicit instructions to engage in PT. Hence, PT was studied as a stable characteristic of adult personality.

A few recent studies from psycholinguistics have shown however that situational manipulations such as increasing the salience of information pertaining to the egocentric perspective can significantly influence PT performance (Kaland et al., 2011; Lane et al., 2006; Lane & Liersch, 2012). In Chapter 2, as we aimed to explain why what another person is looking at interferes more strongly with our judgement of what we see in the VPT task than in the gaze cueing paradigm, we investigated the role of three situational factors that could account for this difference of interference. In Experiment 1 we tested whether the visual stimuli of the VPT task, through their potentially different visual salience, may have boosted the interference but this was not the case. In Experiment 2 we tested whether the higher task complexity of the VPT task, by slowing down the processing of what we see, may have boosted the interference but this was not the case either. In Experiment 3 we hypothesized that the PT instructions made the other person's gaze more task-relevant and thus more salient, which may have boosted the interference. To test this hypothesis without introducing PT instructions, we forced participants to pay attention at the location of the other person. Manipulating the attentional deployment strongly boosted the interference both in the VPT and gaze cueing tasks. These findings suggest that situational factors, such as when the salience is increased or when attention is deployed at the location of another person, can strongly influence our sensitivity to the visual perspective of other people.

Besides long lasting factors that are present only in particular situations, two recent studies have shown that PT performance was significantly and differently affected by the specific emotional state healthy adults were transiently induced in (Converse et al., 2008; Yang et al., 2010). In Chapter 3, we looked at the impact of transiently induced feelings of guilt, anger, and shame on PT. In Experiment 1 we found that participants induced in a state of guilt were better at judging what another person sees than at judging what they see for themselves. This other-centred advantage was not found among those induced in a state of anger or in a neutral state. As we replicated this effect of guilt on perspective taking, we also found that high levels of self-incompetence and shame were concomitant with guilt feelings, which prevented us from determining which feeling actually drove the other-centred effect. In Experiment 2 we induced only feelings of shame and self-incompetence and found a completely different effect: The participants of the shame condition had lower PT performances than those in the control condition in the sense that they were less able to judge what they or the other person sees when the visual contents differed between perspectives. These findings provided strong evidence that transient factors such as our emotional state can significantly influence PT performance.

Finally, numerous studies have highlighted that PT can be manipulated by explicitly asking adults to imagine the other person's perspective as their objective of the task (Dovidio et al., 2004; Ku et al., 2010), which suggests that motivational factors could also affect PT performance. In Chapter 4, we have shown that, although narcissism is consistently negatively associated with PT habits, narcissists had higher PT performances than non-narcissists. Based on this finding, we argued that, among narcissists, motivational factors such as goals of caring about others and self-enhancement are likely to reduce and increase PT habits and performances, respectively.

Altogether, in Chapters 1, 2, 3, and 4 we have highlighted the role of transient factors in influencing PT performance, which supports the view that PT is not static but dynamic.

1.2 Perspective taking is a multidimensional ability

We have seen in Chapter 1 that the most famous multidimensional model of PT was developed to explain PT development and included a core mechanism allowing to impute increasingly richer mental states and a selection mechanism allowing to select non-egocentric mental states to impute (Leslie et al., 2004; Leslie, 1987). Given that in adults the core mechanism is supposed to be full-fledged, PT performance is widely considered as resulting solely from the ability to put aside what we see, know, feel, or believe from our egocentric perspective (Epley et al., 2004; Gilovich & Savitsky, 1999; Tamir & Mitchell, 2010). The ability to put aside our conflicting egocentric perspective has been found to be strongly underpinned by domain-general executive control abilities and inhibitory control in particular (Brown-Schmidt, 2009; Lin et al., 2010; Wardlow, 2013). However, this one-dimensional view of PT is based on the assumption that our egocentric perspective is always the most salient, accessible, or prioritized source of information when inferring what other people are thinking or experiencing. Recent studies have however designed PT tasks in which the other person's perspective seemed to be sufficiently salient to be computed despite holding a conflicting egocentric perspective and despite receiving no instruction to compute it (Kovács et al., 2010; Samson et al., 2010; Schneider, Nott, et al., 2014; van der Wel et al., 2014). As it seems that the egocentric perspective is not always the most prioritized perspective during PT, it seems relevant to assess the extent one prioritizes his egocentric perspective over other people's perspectives along with the ability to handle our conflicting egocentric perspective as two potential dimensions underpinning PT performance.

In this thesis, we assessed PT performance with the visual perspective-taking (VPT) task designed by Samson et al. (2010), which allows to separately assess the ability to handle conflicts between perspectives and the relative attentional priority given to the processing of the egocentric perspective over another person's perspective. In Chapter 3, as we looked at the impact of guilt, anger, and shame on PT, we replicated a previous study (Yang et al., 2010) showing that guilt and shame increase and reduce PT performance, respectively. Most importantly, we showed that shame specifically affected conflict-handling performance whereas guilt specifically affected the relative priority given to the egocentric versus altercentric perspective. These findings support therefore that these two dimensions are functionally relevant in explaining how emotions affect PT performance.

In Chapter 4, we were interested in assessing how narcissism affects PT performance. Because narcissists are prototypically described as self-centred individuals and no study ever reported an association between conflict handling and narcissism, we used the VPT task instead of a more traditional one-dimensional measure of PT to test this hypothesis. We found no impact of narcissism on conflict handling performance but noted a specific impact on the relative self-other perspective priority. This finding supports therefore that assessing the two dimensions separately allows testing and capturing effects that may have been not captured with a one-dimensional measure of PT performance.

In Chapter 5, we tested the specific hypothesis that there exists a significant and independent amount of inter-individual variability on both dimensions. To test this hypothesis, we inspected how a large number of participants who completed the VPT task would cluster following an algorithm aiming to maximize the explanation of PT inter-individual variability. We found that participants were clustered in 4 groups of perspective-takers, two were characterized for being either particularly good or particularly poor at handling conflicting perspectives, and two were characterized for particularly prioritizing either their egocentric perspective or the other person's perspective. These results suggest therefore that the assessment of inter-individual differences on PT performances (which was traditionally scoring performance on a one-dimensional poor-to-good performance continuum) should be scaled up in a two-dimensional space defined by the ability to handle conflicting perspectives and the relative self-other perspective priority. In addition, assessing the two dimensions separately allowed finding a significant predictive effect of the relative self-other perspective priority on self-reported everyday life perspective-takings habits that could not be captured with the one-dimensional measure of PT performance.

Altogether, we repeatedly demonstrated the relevance and usefulness to study PT performance as a two-dimensional ability as it allows capturing or targeting specific impacts of various independent variables and to better characterize individuals' profiles of PT performance.

In the following section, I will discuss the implications and limits of our findings.

2. Discussion

2.1 Generalizability of our findings

All our findings are based on a single task that measures level 1 VPT. Arguably, asking to infer what another person sees, feels, desires, believes, or intends recruits different processes and different levels of cognitive resources following the inferential process required. Therefore, one can expect that our findings may not extend to PT tasks involving other type of inferential processes or to PT performance in real life. However, the inferential process of level 1 VPT, which consists in drawing a mental line (of sight) from a person to an object (Michelon & Zacks, 2006), is highly efficient (Qureshi et al., 2010), develops earliest (Flavell, 2004), and is accessible to non-human animals species (e.g., Bräuer et al., 2004). In other words, level 1 VPT requires the most basic inferential process. Therefore, measuring level 1 VPT puts us in the best possible condition to reduce to a minimum the possibility that the effects of the manipulated variables and the observed inter-individual differences were driven by different inferential performances rather than different performances on the two dimensions of interests.

Now, whether these two dimensions reflect a core architecture underpinning any type of PT is the key question. In my view, although the information content processed influencing the handling of conflicting perspectives or the relative priority given to a particular perspective might be domain-specific (i.e., proper to social cognition or to level 1 visual perspective taking), the cognitive processes underpinning the two dimensions are domain-general: The relative priority given to the egocentric and altercentric perspectives is the product of top-down and bottom-up attentional processes and the handling of conflicting perspectives is the product of executive processes (i.e., monitoring, switching, inhibition; cf. infra "Beyond two dimensions"). Hence, I am confident that our findings generalize to other forms of PT. This view is supported by the fact that egocentric biases and their relation to executive processes can be found across verbal (auditory and visual) and non-verbal (visual and tactile) perspective-taking tasks that require to infer other people's intentions (Keysar, 1994), knowledge (Camerer et al., 1989), beliefs (Carlson et al., 1998; T. P. German & Hehman, 2006; Newton & de Villiers, 2007), visual experiences (Keysar et al., 2000; Lin et al., 2010; Qureshi et al., 2010), and emotions (Gilovich et al., 1998; Silani et al., 2013). It is therefore reasonable to think that the common cognitive mechanisms present in all these forms of PT are those underpinning the two dimensions studied in this thesis.

In Chapter 3 we reported beneficial and detrimental effects of guilt and shame, respectively, on level 1 VPT performance. This pattern of results replicated the findings of Yang et al. (2010) who used a PT task requiring to infer the extent of sarcasm in a message perceived by a person who has no knowledge of the sarcastic intent of the message. Correct performance required to suppress the reliance on the privileged knowledge that the message was sarcastic and to infer that the other person has a false belief that the message is sincere rather than sarcastic. It would seem therefore that shame and guilt specifically impacted cognitive processes common to both the level 1 VPT task and the verbal False Belief task. In Chapter 4, we found a significant association between self-reported everyday-life narcissistic habits and a specific dimension of level 1 VPT performance; which suggest that VPT captures to some extent a real-life facet of interpersonal behaviour. In the same line, in Chapter 5, we found a significant relationship between level 1 VPT and self-reported PT habits of the everyday life; which strongly suggests that level 1 VPT to some extent reflects a real-life facet of PT.

Altogether, it seems reasonable to think that, although we used a single PT task, our findings generalize to other forms of PT in real life and in other PT tasks. However, it is important to note that the effects on PT performance in PT tasks requiring more complex inferential process are more likely to reflect an impact on inferential processes only and therefore these effects might not generalize to PT with other forms of inferential processes.

2.2 Extending the two-dimensional account outside visual perspective taking

The last decade of research in social cognition has been particularly marked with accumulating evidence that we spontaneously process others' actions and mental states. This has been mainly evidenced by showing altercentric interferences, that is, reduced performance caused by the processing of information related to another person that is conflicting with the adequate completion of the task at hand. For examples, Sebanz, Knoblich, and Prinz (2003) used a Go-No Go task in which performance is interfered by the spatial incompatibility between the direction in which the picture of a finger was pointing (left or right) and the location of the button to press (right or left) when receiving instructions to press either the left or the right button (two-choices task). For example, if a finger is pointing rightward, it takes longer to press on the left button than on the right button; this interference is called the Simon effect (Simon, 1969). Importantly, this interference disappears when only one button has to be pressed (one-choice task). Their key finding is that they found that this interference among participants instructed to press on only one button when another person placed aside is instructed to press the other button; this unexpected interference was interpreted as reflecting the automatic computation of another person's intentions (Sebanz et al., 2003). In another study (Brass, Bekkering, Wohlschläger, & Prinz, 2000), the interference in a two-choices task caused by the incompatibility between executed and observed (but irrelevant) finger movements was interpreted to reflect the automatic imitation of others' movements. In a study by Zwickel (2009), performance in judging the location of dots was interfered by the incompatibility between the location of a dot with regard to the participants' perspective and a moving triangle's perspective. This interference was however only present when the triangle had moved as if it was a social agent; this interference was interpreted as reflecting the automatic representation of the triangle's visual perspective. In a study by Van der Wel and colleagues (2014), the interference in participants' hand movement trajectories by a social agent's false belief was interpreted as reflecting the automatic computation of another person's belief. Whether a person spontaneously (or automatically) computes others' actions and mental states is measured by the size of the altercentric interference.

We have seen in Chapter 1 that the extent to which a person is egocentrically biased (or has poor PT performance) is also measured by the size of the interference but caused by our conflicting egocentric perspective. However, we have seen in Chapter 5 that the size of the egocentric and altercentric interferences are underpinned by both the relative attentional priority given to the processing of the egocentric and other person's perspective and the ability to suppress the interference from the conflicting perspective. Consequently, it is likely that the same dimensions underpin the size of the altercentric interference outside VPT. If this is the case (but it remains to be tested), three important implications must be noted. First, we should consider the possibility that some participants do not show signs of being interfered by another person's actions or mental states because these individuals are particularly good at suppressing the interference rather than being particularly 'insensitive' to others. Second, it is possible that the size of the interference is dependent on the availability of executive resources. This latter possibility is actually supported by the study of Qureshi and colleagues (2010) who reported increased egocentric and altercentric interferences in the VPT task when concurrently completing a task tapping on inhibitory control. Third, it is possible that altercentric interferences are influenced by transient factors rather than reflecting the enduring sensitivity to others' actions and mental states. This latter possibility is further discussed in the next section in relation to the implicit / explicit division of perspective taking.

In sum, I am confident that this two-dimensional account is highly relevant to explain egocentric and altercentric interferences equally well and therefore it should enrich our understanding of phenomena of social cognition beyond VPT.

2.3 A salience account of the explicit – implicit PT division

In chapters 1 and 5, we have reviewed the accumulating recent evidence that adults and infants seem to spontaneously (or automatically) compute other people's beliefs (Kovács et al., 2010; Onishi & Baillargeon, 2005; Schneider, Nott, et al., 2014; Sodian et al., 2007; Surian et al., 2007; van der Wel et al., 2014) and visual perspectives (Samson et al., 2010; Santiesteban et al., 2013; A. D. R. Surtees & Apperly, 2012). In other words, it has been claimed that they *implicitly* track others' mental states. This claim is built on the distinction between explicit and implicit memory (Graf & Schacter, 1985) where explicit PT refers to conscious and intentional tracking of another person's mental state while implicit PT refers to non-conscious and unintentional tracking. This distinction maps with the multidimensional model proposed by Apperly and Butterfill (2009) who proposed that we possess two distinct systems to track others' mental states: a rapid, automatic but cognitively limited system and a slow, effortful, controlled but cognitively flexible system underpinning implicit and explicit PT, respectively.

Although I agree that the implicit/automatic versus explicit/controlled division can be a convenient classification of behavioural evidences of PT, I think that the same cognitive architecture underpins both types of PT. More specifically, the spontaneous tracking of others' mental states may merely reflect the salience of the information pertaining to the other person's mental state. In other words, whether someone will track another person's mental state is probably strongly determined by the presence of transient factors that will influence the salience of the other person's mental state. This view is shared with (T. C. German & Cohen, 2012) who encouraged the study of PT "*in terms of cues that engage it*" (p. 47) and stated that these cues could be the stimuli but also contextual information such as the task instructions (e.g., "Press the bar the bar when the agent comes in" in Kövacs et al., 2010), the repeated exposure to unpredicted probes about mental states, or the alternation of mental state-relevant and mental state-irrelevant trials. In explicit PT tasks, the most determining cue is the instruction to track the social agent's mental state; these instructions promote top-down biasing towards the social agent's mental state and thus boost its salience. In Chapter 2, we provided evidence that the size of our 'sensitivity' to where another person is looking at was strongly determined by the presence of particular cues that modify the salience of the social agent. I argue therefore that evidence of implicit mental states tracking is the result of unique blends of cues that boost the salience of a social agent's mental state. In my view, these blends are like complex recipes, they are hard to obtain and replicate and the outcome might be unstable from one person to another. Recent efforts have been made to understand the triggering conditions of implicit PT (e.g., Meert & Samson, 2013).

An important argument in favour of the distinction between explicit and implicit PT, which led Apperly and Butterfill (2009) to propose two distinct systems underpinning each type of PT, comes from findings of contrasting PT performances following that implicit or explicit measures were taken on the same task with the same individuals. Clements and Perner (1994) first evidenced this contrast by showing that children seemed to pass the False Belief test based on their anticipatory looking (on the location where another person should erroneously look for his object) but only half of these children gave a correct explicit answer (verbal response or pointing). This finding was replicated several times but always with anticipatory looking as an implicit measure (Garnham & Perner, 2001; Low, 2010; Ruffman et al., 2001). These contrasting performances support that there are different systems of PT. However, while it is well known that the point of fixation of the eyes is determined by the salience of stimuli (e.g., Van Zoest, Donk, & Theeuwes, 2004), fixation does not always lead to conscious access to the stimulus. This failure to consciously access processed information is explained by the existence of two different early processing visual pathways (for a review, see Mulckhuyse & Theeuwes, 2010) but it certainly does not advocate for the presence of two distinct PT systems. Within the field of consciousness research, it is well known that an absence of awareness of stimuli does not mean that these stimuli were not processed (for a review, see Kouider & Dehaene, 2007), even for complex stimuli (Mudrik, Breska, Lamy, & Deouell, 2011). For example, according to Dehaene and collaborators (2006), preconscious stimuli are characterized for having a high stimulus-driven salience and not benefiting from enough top-down attention (such as the absence of instructions to track mental states); these stimuli are sufficiently salient to be self-maintained temporarily (Dehaene, Changeux, Naccache, Sackur, & Sergent, 2006).

Finally, it must be acknowledged that salience will not explain everything, the high salience of the stimuli will ensure that the stimuli will be processed but if the inferential process requires top-down voluntary control, as when reasoning with multiple embeddings of information (e.g., 2nd and 3rd order ToM tasks), it is possible that the salient stimuli will not be processed in mental state representations. Interestingly, even if those stimuli cannot be sufficiently processed to become mental state representations, they might still interfere with the conscious processing of information relevant to the task at hand such as when instructed to make egocentric judgments. Hence, there is a possibility that these interferences – that are usually interpreted as implicit or automatic mental state tracking – might not reflect the representation of another person's mental state (i.e., mentalizing) but are a rawer form of mentalizing called *submentalizing* (Heyes, 2014b). This point is addressed in the next section.

In sum, the fact that we observe different patterns of performance following that tracking mental state is explicitly instructed or not does not necessarily mean that we possess two distinct PT systems – one implicit/automatic and the other explicit/controlled. Instead, a more parsimonious (and neurobiologically plausible) account is that whether explicit instructions are needed to process a social agent's mental state is dependent on the salience of the information pertaining to the social agent's mental state (which is determined by the combination of stimulus-driven and contextual cues) and on the extent to which the inferential process requires voluntary control.

2.4 Does automatic perspective taking reflect mentalizing?

Heyes (2014a, 2014b) recently provided a critical analysis of what specific cues led to interpretations of implicit and automatic mental state tracking, questioned whether mental states were actually inferred, and advocated for replacing the notion of mentalizing by submentalizing – "*domain-general cognitive mechanisms that simulate the effects of mentalizing in social contexts*" (Heyes, 2014b, p. 131). This 'submentalizing hypothesis' has been also applied to the level 1 VPT task we used. For the record,, it was proposed in the first studies using the level 1 VPT task in healthy adults (Qureshi et al., 2010; Samson et al., 2010; A. D. R. Surtees & Apperly, 2012) that the presence of altercentric interferences (i.e., interference when judging what we see for ourselves when another person sees something different) was reflecting the automatic computation of the social agent's visual perspective. Heyes (2014b) argued that this interference is not caused by the social agent *seeing* something different but by the social agent *directing* attention towards a location detrimental for the task at hand. Accordingly, it has been consistently demonstrated in the gaze cueing paradigm that eyes, heads, and bodies efficiently and spontaneously orient attention towards where they are directed to, which increases or reduces performance in detecting/identifying targets (e.g., discs) following that the targets are located where the attention was oriented or not, respectively (Driver et al., 1999; Friesen & Kingstone, 1998b; Hietanen, 1999, 2002). Thus, it can be argued that the altercentric interference found in the VPT task reflects a mere detrimental orienting of attention rather that the representation of a competing visual perspective.

In Chapter 2, we have shown, however, that the interference caused by the orienting of attention in a gaze cueing paradigm is 3 times smaller and less robust (i.e., cannot be found with an SOA of 0 ms) than the interference observed in the VPT task. My 'mentalizing hypothesis' is that the PT instructions, even where required to take only our egocentric perspective, would 'upgrade' the processing of the social agent and what he looks at from attentional orienting to mental state representation. The mentalizing hypothesis is that a mental state representation is a stronger competitor with our egocentric representation (because of the high target – distractor similarity; Theeuwes, 1992) than a detrimental attentional orienting, and this is what causes the stronger interference in the VPT task. However, in favour of the submentalizing hypothesis (and our salience account) we found in Experiment 3 that merely increasing the amount of attention deployed on the social agent (by forcing participants to read a prompt super-imposed on the social agent) has strongly increased the size of the interferences both in the VPT and gaze cueing tasks. However, in favour of the mentalizing hypothesis, the increased interference in the gaze cueing task was still smaller than in the original VPT task and, more importantly, the increased attentional deployment doubled the interference usually found in original VPT task. In my view, if the interference in the VPT task was already entirely driven by the high attentional deployment on the social agent due to contextual cues such as its task-relevance, further increasing the attentional deployment could not have doubled the interference. A more plausible explanation of this doubled interference is that two independent factors boosting the interference were combined: the representation of what a social agent is looking at as a mental state and the increased salience of the information pertaining to the social agent. This hypothesis remains however to be tested.

Given the fact that attentional orienting also occurred with pointing arrows, Santiesteban et al. (2013) attempted to show that the interference found in original VPT tasks could also be found when replacing the social agent by an arrow, which would strongly support the submentalizing hypothesis (since a static arrow is not social agent). To test this, they used the version of the VPT task where only self-perspective judgments were required (see Experiment 3 in Samson et al., 2010) but half of the time – in a mixed randomized order – an arrow was presented instead of a social agent. They found equally sized inferences on trials with an arrow and a social agent, which was interpreted as strongly supporting the submentalizing hypothesis. However, it is also likely that the direction the arrow was pointing at was computed as a mental state because this inferential process was already applied half of the time when the social agent was present. Finally, it is important to note that we might be in a better position to argue for a mentalizing hypothesis in the context of level 1 VPT than in other forms of PT because its inferential process is highly efficient and cognitively rudimentary. Therefore, the extent to which the inferential process is cognitively demanding and sophisticated qualifies the theoretical plausibility of automatic or implicit mentalizing (cf. previous section).

Altogether, the current empirical evidence cannot determine which of the mentalizing and submentalizing hypotheses are correct in the context of the VPT task. Moreover, it is also possible that the social agent and what he is looking at are processed at an intermediary level between a mere shift of attention and a mental state; which further complicates establishing the exact representational level of what the social agent is looking at. Nevertheless, even if incoming information did not reach the stage of a mental state representation, the spontaneous computation of this information would still show that we are tuned to be sensitive to other people's thoughts and actions; which allows us to have adequate social interactions. In other words, it is possible the raw computation of information pertaining to others' thoughts and actions is good enough in many social situations. For example, if, while talking, a person in front of me makes an averted eye movement, I will probably pay attention to where he is looking at without inferring that he must have seen something different from what I can see, which nevertheless will allow me to know what he is looking at. Mentalizing would however be necessary to understand why he looked in that direction.

2.5 Beyond two dimensions

Throughout this thesis we provided a two-dimensional account of PT performance, which was a step forward compared to the widespread one-dimensional approach of PT.

However, it is beyond doubt that these two dimensions are not enough to fully predict PT performance and that these two dimensions can be split in smaller dimensions.

A first important point to acknowledge is that so far we purposefully disregarded the inferential process involved in PT. This was done to focus on the core mechanisms of PT (cf. previous section about the generalizability of our findings) but it would be wise to take into account the potential factors that may influence performance in inferential processes when trying to predict PT performance. Intuitively, in terms of inter-individual differences, it seems clear that inferential performance would be greatly influenced by whether one has (1) some knowledge or experience of what the other person is going through, (2) learned many of the infinite causal relations proper to the social domain, or (3) good reasoning skills to apprehend the other person’s situation in its full complexity. Inferential performance should therefore be a third independent dimension to assess or predict PT performance.

Further progress in predicting PT performance can be made by fractionating the two dimensions we have put forward. The ability to handle conflicting perspectives and the relative priority given to the information pertaining to the egocentric perspective versus another person’s perspective both encompass several cognitive mechanisms that could be assessed separately to predict PT performance. I discuss (and speculate) in turns which mechanisms underpin the two dimensions.

In my view, handling the conflicts between perspectives requires a cascade of executive functioning mechanisms. A high emphasis has been put on the inhibition/selection mechanism allowing the suppression of information pertaining to the conflicting irrelevant perspective, but the working memory capacity, monitoring and shifting abilities are also core executive functioning mechanisms (Miyake et al., 2000; Wager, Jonides, & Reading, 2004) likely to be involved in the process of handling conflicts. Before handling a conflict, the conflict must be detected. Conflict detection is an independent executive functioning mechanism most often referred to as monitoring (Botvinick, Braver, Barch, Carter, & Cohen, 2001; Botvinick, Cohen, & Carter, 2004). Monitoring consists in continuously providing signals about the “interest” of pursuing a current activity, or mind-set (e.g., attending to what another person is looking at, running straight ahead, or planning to close the door). This interest is reduced when (i) a conflict or an error is detected or predicted (e.g., what I see conflicts with what the other person sees), (ii) the value of the outcome/cost/certainty ratio of the current mind-set has diminished, or (iii) an alternative and higher potential outcome or reward is detected (Botvinick et al., 2001, 2004; Dosenbach et al., 2006; Ridderinkhof, van den Wildenberg, Segalowitz, & Carter, 2004; Rushworth, Walton, Kennerley, & Bannerman, 2004; Woodward, Metzak, Meier, & Holroyd, 2008). This reduced interest signals the need to update what information to process or to switch to another mind-set so that the initially expected outcome (e.g., successfully judge what another person is looking at) or a more rewarding outcome might be attained (Wager et al., 2004); this is achieved by a shifting mechanism usually described as a gate that opens to update/switch and closes to maintain information in working memory (Braver & Cohen, 2000; Hazy, Frank, & O'Reilly, 2007). Our shifting ability, sometimes also referred to as cognitive flexibility, reflects our sensitivity to these signals and how quickly we adjust or shift the outdated mind-set with a mind-set from which a more rewarding outcome is expected (e.g., inhibit egocentric information; Aston-jones & Cohen, 2005; Berridge & Waterhouse, 2003; Briand, Gritton, Howe, Young, & Sarter, 2007). Finally, the working memory capacity is also critical as it allows to maintain information relevant to the current mind-set (e.g., instruction to judge what another person is looking at) even if this information is not perceptually available (Baddeley, 1992, 2012). Thus, working memory capacity reflects the amount of information that can be maintained over time. Finally, inhibition per se is better understood as a mechanism of selective attention that biases the neural competition between different sources of information; this bias favours the maintenance of, or access to, information relevant to the mind-set (e.g., what the other person is looking at) and hinders the maintenance of, or access to, information irrelevant to the mind-set (e.g., what I see from my egocentric perspective; Desimone & Duncan, 1995; Miller, 2000).

In sum, conflict-handling performance is probably underpinned by four sub-dimensions: monitoring, shifting, working memory capacity, and inhibition/selection. Theoretically, each of these dimensions can be specifically impacted. For example, in the study of Todd et al. (2011), priming a focus on dissimilarity or similarity led to higher and lower PT performances, respectively; one can expect that the manipulation specifically affected monitoring performance in detecting a conflict between perspectives. Furthermore, there is also some evidence that emotions can either disrupt the maintenance of information in working memory or disrupt shifting and lead to maladaptive distractibility and perseveration, respectively (Aston-jones & Cohen, 2005; Briand et al., 2007; for a detailed discussion on this topic, see Bukowski, 2009). Disentangling the respective contributions of each of these mechanisms might be a challenging avenue of research but would certainly extend our understanding of PT.

As for delineating dimensions underpinning the relative priority given to the processing of the egocentric versus someone else's perspective, there is no sizable dimension to pinpoint but rather a myriad of factors influencing salience that can be grouped in broad categories. Accordingly, the relative priority given to the processing of the egocentric versus someone else's perspective is not an ability per se but a ratio between the salience of the information needed to construe another person's mental state and the salience of the information pertaining to our egocentric perspective. Thus, any ability, sensitivity, or factor influencing the salience of stimuli informative to either of the perspectives can be considered as an underpinning dimension. Nevertheless, a broad distinction can be made between stimulus-driven (or bottom-up) and contextual (or top-down) factors. Among stimulus-driven factors, the salience is determined in a bottom-up fashion by how rewarding (Sui et al., 2012), arousing (Arnell, Killman, & Fijavz, 2007), contrasting (Treisman & Gelade, 1980), and abrupt (Jonides & Yantis, 1988) the stimulus is. Among contextual factors, the salience is determined in a top-down fashion by how goal/task-relevant (Treisman & Gelade, 1980), predictable (Theeuwes & Burger, 1998), or close from the locus of attention (Downing, 1988) the stimulus is (for a review, see Corbetta & Shulman, 2002).. Within this myriad of factors, it is possible that important factors such as sensitivity to social reward, emotional sensitivity, or personal goals/ideals/values may affect the salience of a large array of stimuli; this avenue of research is wide open.

2.6 Are the two dimensions independent?

Along this thesis we claimed that with the VPT task, by crossing orthogonally the perspective to take and the level of conflict between perspectives, we could assess the perspectives conflict handling ability and the relative self-other perspective priority as two independent dimensions underpinning PT performance. However, one could argue that these two dimensions are not independent because manipulating the salience of one perspective should directly impact the performance in inhibiting this perspective. In my view, these two dimensions are underpinned by different cognitive mechanisms and brain areas but, in the same time, they strongly interact and recruit overlapping brain areas. The extent one manages to inhibit/ignore a stimulus reflects the strength of the task-set (encoded goals or instructions) and its influence on posterior cortices through top-down projections from the prefrontal cortex to the posterior cortices (Desimone & Duncan, 1995; Miller, 2000). The extent one prioritizes a stimulus over another reflects its salience, which is calculated through the integration of the competing stimuli coming from unimodal areas into a salience map that is represented in a multimodal area such as the inferior parietal lobule (including the temporoparietal junction and the intraparietal sulcus; Downar et al., 2002; Itti & Koch, 2000; Mavritsaki, Allen, & Humphreys, 2010). In line with this view, Ramsey et al. (2013) collected neuroimaging data during the completion of the VPT task and found that the prefrontal cortex and the inferior parietal lobule were both more activated when the inhibition of a salient perspective was involved than in the condition where the perspective to take is already the most salient perspective (i.e., the other-perspective/consistent perspective condition). In the same line, in a task in which individuals prioritize the processing of their own face over the faces of other people, Sui, Chechlacz, Rotshtein and Humphreys (2013) reported that patients who have prefrontal damages over-express this self-face prioritization because executive deficits prevent its regulation, whereas those who have damages to the hippocampus and fusiform gyrus showed a low self-face prioritization because these areas are involved in the self-face processing itself. In addition, Sui, Rotshtein, and Humphreys (2013) found, in a task where the processing self-related shapes is prioritized, that only the processing of non-self-related shapes recruited the lateral prefrontal cortex as the executive demand was higher for these less salient stimuli. Finally, I think that the parietal lobule (and particularly the temporoparietal junction) functionally sits at the crossing of inhibitory control and salience computation, which is why this area is often strongly associated with perspective taking (see the meta-analyses from Schurz, Aichhorn, Martin, & Perner, 2013; Van Overwalle, 2009). However, both the excitatory and inhibitory modulation of this region can lead to the enhanced suppression of a salient perspective as it is unclear whether this modulation increases the salience or the suppression of the perspective (Santiesteban, Banissy, Catmur, & Bird, 2012; Silani et al., 2013).

To sum up, the ease of taking another person's perspective depends on how salient is the information pertaining to the other person's perspective and this salience is typically (but not always[6]) computed in the temporoparietal junction by integrating incoming processed information from posterior areas. However, this salience can be voluntarily biased through top-down projections from the prefrontal cortex representing our goals. Hence, the two dimensions we hypothesized to underpin PT performance rely on functionally and neurally distinct mechanisms although a strong overlap exists as well.

2.7 Perspective taking under emotion

In Chapter 3, we found that shame and guilt affect PT performance. Emotions are not unusual events and if emotions fluctuate, so might PT performance. This implies that any investigation of PT performance should control for participants' emotional state if they aim to obtain an accurate 'baseline' assessment of PT abilities and to insure good test-retest reliability. In addition, strong emotional feelings are highly concomitant with many mental disorders and therefore might be the causal factor of the social cognitive deficits reported in disorders such as depression (Segrin, 2000) and schizophrenia (Langdon, Coltheart, Ward, & Catts, 2001).

In everyday life, when we are interacting with others, we continuously have to take the perspective of another person in order to understand and to be understood by the other person. Being conscious of the impact of emotions, ubiquitous in social interactions, on this ability could help inter-individual communication. Realizing the impact of emotions on PT abilities is particularly important in professions in which inter-individual communication (and thus PT) is central such as psychologist, judge and teacher. For instance, a psychologist may be prone to emotions towards his patient, which can influence his abilities to understand him. Conversely, emotions felt by a patient will influence his ability to understand his psychotherapist and probably the overall efficiency of the psychotherapeutic process. Therefore, impact of emotions on PT abilities is an important variable which has to be taken into account in many professional and social situations. Surprisingly, only 2 published studies have investigated the impact of emotions on PT so far, I am hopeful that this thesis will allow attracting attention to this new and promising avenue of research.

---

[6] The exact location of the multimodal integration of the incoming stimuli depends of the sensory properties of the stimuli such as the modality (e.g., tactile vs. visual) and the type of processing required (e.g., object recognition vs. spatial location).

2.8 Future studies

Given that, first, research on what influences PT performance in the healthy adult population has only recently emerged and, second, we provided evidences challenging two traditional approaches of the study of perspective taking, the possibilities for future studies are wide open. I will focus on several questions that particularly caught my attention.

Can we generate implicit and automatic perspective taking by manipulating salience? I have argued earlier that the presence of implicit or automatic PT does not reflect the existence of a distinct PT system but instead reflects the existence of particular blends of stimulus-driven and contextual cues that boost the salience of information pertaining to the perspective of another person. This should be tested by showing a progressive increase of the magnitude of altercentric interference while progressively adding cues that boost the salience of the other person's perspective.

How generalizable is the two-dimensional account? Given that the two dimensions reflect executive abilities and attentional factors, I expect that the effects found in the VPT task should also be found in other social cognitive tasks. For example, Silani, Lamm and collaborators (2013) developed an empathy task with an experimental design similar to that of the VPT task in the sense that it crosses the perspective to take with the level of conflict between perspectives; this task could therefore be used to test this hypothesis and more generally to assess what influences empathy along the two dimensions.

Does social sensitivity reflect poor inhibition skills? It would be interesting to assess the role of executive abilities in predicting the size of altercentric interferences outside perspective taking as well. The finding of a significant role of executive performance in automatic computation, or sensitivity to others' thoughts and actions, would encourage the use of our two-dimensional account outside VPT and qualify the extent to which these interferences are social and automatic.

Is there a linear relationship between measured perspective-taking performance and social wellbeing? In Chapter 5 we have delineated four groups of good perspective-takers: one group was particularly good at handling conflicting perspectives and another strongly prioritized the processing of the other person's perspective. It is possible, however, that extremely high scores on these dimensions might not be associated with good real-life interpersonal skills. Accordingly, we could speculate that being hypersensitive to others' views either reflects or causes reduced social wellbeing (e.g., abnegation). Moreover, interferences reflecting spontaneous sensitivity to others' thoughts and actions could, theoretically, be entirely suppressed if a person is good at it. Will this person experience social wellbeing if he proficiently suppresses all the subtle social cues that are irrelevant to his task at hand? In sum, there might a non-linear (probably quadratic) relationship between PT performance and social wellbeing.

How does motivation impact perspective-taking performance? So far no study has looked at the impact of motivation on PT performance (see, however, a qualitative study by

Gehlbach, Brinkworth, & Wang, 2012). In Chapter 4, we provided evidence that narcissists are good at perspective taking although the opposite pattern was found when measured self-reported habits. This contradiction is likely to be explained by the fact that self-reports measured prosocial motivation while the VPT task measured actual abilities; however, this hypothesis and the role of motivation in general should be investigated or at least controlled in future studies.

3. Conclusion

What influences perspective-taking performance in healthy adults? Decades of research were dedicated to the understanding of how perspective-taking abilities develop and what makes us more or less likely to engage in perspective taking. A particular focus on performance in the healthy adult population has emerged only recently and especially points out the importance of domain-general executive abilities, which underpin the ability to suppress our conflicting egocentric perspective and select information pertaining to another person's perspective. However, current approaches to perspective taking heavily rely on the assumption that perspective taking is a static characteristic and a one-dimensional construct. For this reason, perspective taking is being studied as if performance does not significantly fluctuate from one situation to another or over time, and performance is scored along a one-dimensional continuum ranging from poor to good.

This thesis aimed to enrich our understanding of what influences perspective taking by challenging the assumptions that perspective taking is a static and one-dimensional ability. In Chapters 2 and 3, we provided evidence that transient factors such as drawing attention towards a person or feeling ashamed or guilty significantly affect perspective-taking performance. In addition, in Chapter 4 we have highlighted the potential role of motivational factors on perspective-taking performance, which could explain why we found that narcissists are not impaired at perspective taking despite the fact that self-reports of perspective-taking habits suggest the opposite. These findings strongly challenge the view that perspective-taking performance is a stable characteristic and encourage the investigation of perspective taking as a dynamic ability.

We also provided evidence that perspective-taking performance is not solely underpinned by the ability to handle conflicts between our egocentric perspective and the perspective of another person but also by the relative priority given to the processing of the egocentric perspective relative to another person's perspective. Across the Chapters 2, 3, 4, and 5 we found that each of the two dimensions can be specifically affected or associated with factors such as guilt, shame, narcissism, and self-reported perspective-taking habits. Moreover, we found in Chapter 5 that individuals strongly vary on both dimensions so that some people are characterized as being either particularly good or particularly poor at handling conflicting perspectives, and other people are characterized as strongly prioritizing either their egocentric perspective or other people's perspectives. These findings deeply challenge the view that perspective taking is a one-dimensional construct by showing that the salience of our egocentric perspective relatively to another person's perspective is actually highly variable across individuals and situations.

Finally, while investigating what influences perspective-taking performance, this thesis repeatedly demonstrated the theoretical relevance and usefulness of studying perspective taking as a dynamic and multidimensional ability. This approach paves the way for a richer understanding of perspective taking but also of other phenomena in social cognition.

References

Akhtar, S., & Thomson, J. A. (1982). Overview: Narcissistic personality disorder. *Am J Psychiatry*, *139*(1).

Ali, F., & Chamorro-Premuzic, T. (2010). Investigating Theory of Mind deficits in nonclinical psychopathy and Machiavellianism. *Personality and Individual Differences*, *49*(3), 169–174.

Allpress, J. (2011). *The role of shame in motivating support for, and opposition to, intergroup reconciliation* (Doctoral dissertation). University of Sussex, UK. Retrieved from http://sro.sussex.ac.uk/39374/1/Allpress%2C_Jesse.pdf

American Psychiatric Association. (2000). *Diagnostic and statistical manual of mental disorders (4th ed., Text Revision)*. Washington, DC: American Psychiatric Association.

Apperly, I. A., Back, E., Samson, D., & France, L. (2008). The cost of thinking about false beliefs: evidence from adults' performance on a non-inferential theory of mind task. *Cognition*, *106*(3), 1093–108.

Apperly, I. A., & Butterfill, S. A. (2009). Do humans have two systems to track beliefs and belief-like states? *Psychological Review*, *116*(4), 953.

Apperly, I. A., Samson, D., Chiavarino, C., Bickerton, W., & Humphreys, G. W. (2007). Testing the domain-specificity of a theory of mind deficit in brain-injured patients: evidence for consistent performance on non-verbal, "reality-unknown" false belief and false photograph tasks. *Cognition*, *103*(2), 300–21.

Apperly, I. A., Samson, D., & Humphreys, G. W. (2005). Domain-specificity and theory of mind: evaluating neuropsychological evidence. *Trends in Cognitive Sciences*, *9*(12), 572–7.

Arnell, K. M., Killman, K. V, & Fijavz, D. (2007). Blinded by emotion: target misses follow attention capture by arousing distractors in RSVP. *Emotion*, *7*(3), 465.

Arriaga, X. B., & Rusbult, C. E. (1998). Standing in my partner's shoes: Partner perspective taking and reactions to accommodative dilemmas. *Personality and Social Psychology Bulletin*, *24*(9), 927–948.

Ashton-James, C. E., & Levordashka, A. (2013). When the Wolf Wears Sheep's Clothing Individual Differences in the Desire to be Liked Influence Nonconscious Behavioral Mimicry. *Social Psychological and Personality Science*, *4*(6), 643–648.

Aston-jones, G., & Cohen, J. D. (2005). An integrative theory of locus coeruleus-norepinephrine function: adaptive gain and optimal performance. *Annual Review of Neuroscience*, *28*, 403–50.

Ausubel, D. P. (1955). Relationships between shame and guilt in the socializing process. *Psychological Review*, *62*(5), 378.

Back, M. D., Küfner, A. C. P., Dufner, M., Gerlach, T. M., Rauthmann, J. F., & Denissen, J. J. a. (2013). Narcissistic admiration and rivalry: disentangling the bright and dark sides of narcissism. *Journal of Personality and Social Psychology*, *105*(6), 1013–37.

Baddeley, A. (1992). Working memory. *Science*, *255*(5044), 556–559.

Baddeley, A. (2012). Working memory: theories, models, and controversies. *Annual Review of Psychology*, *63*, 1–29.

Bailey, P. E., & Henry, J. D. (2008). Growing less empathic with age: disinhibition of the self-perspective. *The Journals of Gerontology. Series B, Psychological Sciences and Social Sciences*, *63*(4), P219–P226.

Baillargeon, R., Scott, R. M., & He, Z. (2010). False-belief understanding in infants. *Trends in Cognitive Sciences*, *14*(3), 110–118.

Bargh, J. A. (1982). Attention and automaticity in the processing of self-relevant information. *Journal of Personality and Social Psychology*, *43*(3), 425.

Baron-Cohen, S. (1989). The autistic child's theory of mind: A case of specific developmental delay. *Journal of Child Psychology and Psychiatry*, *30*(2), 285–297.

Baron-Cohen, S. (1995). The eye direction detector (EDD) and the shared attention mechanism (SAM): Two cases for evolutionary psychology. In C. Moore & P. J. Dunham (Eds.), *Joint Attention: Its Origins and Role in Development* (pp. 41–59). Lawrence Erlbaum.

Baron-Cohen, S., & Wheelwright, S. (2004). The empathy quotient: an investigation of adults with Asperger syndrome or high functioning autism, and normal sex differences. *Journal of Autism and Developmental Disorders*, *34*(2), 163–175.

Baron-Cohen, S., Wheelwright, S., Hill, J., Raste, Y., & Plumb, I. (2001). The "Reading the Mind in the Eyes" Test revised version: a study with normal adults, and adults with Asperger syndrome or high-functioning autism. *Journal of Child Psychology and Psychiatry, and Allied Disciplines*, *42*(2), 241–51.

Barr, D. J. (2008). Pragmatic expectations and linguistic evidence: Listeners anticipate but do not integrate common ground. *Cognition*, *109*(1), 18–40.

Barry, C. T., Frick, P. J., Adler, K. K., & Grafeman, S. J. (2007). The Predictive Utility of Narcissism among Childrenand Adolescents: Evidence for a Distinction betweenAdaptive and Maladaptive Narcissism. *Journal of Child and Family Studies*, *16*(4), 508–521.

Batson, C. D., Polycarpou, M. P., Harmon-Jones, E., & Imhoff, H. J. (1997). Empathy and attitudes: Can feeling for a member of a stigmatized group improve feelings toward the group? *Journal of Personality and Social Psychology*, *72*(1), 105–118.

Batson, C. D., & Powell, A. A. (2003). Altruism and Prosocial Behavior. In *Handbook of Psychology* (pp. 282–316). John Wiley & Sons, Inc.

Baumeister, R. F. (1990). Suicide as escape from self. *Psychological Review*, *97*(1), 90–113.

Baumeister, R. F., Stillwell, A. M., & Heatherton, T. F. (1994). Guilt: an interpersonal approach. *Psychological Bulletin*, *115*(2), 243–67.

Beck, A. T. (1961). An Inventory for Measuring Depression. *Archives of General Psychiatry*, *4*(6), 561.

Beggan, J. K. (1992). On the social nature of nonsocial perception: The mere ownership effect. *Journal of Personality and Social Psychology*, *62*(2), 229.

Bernstein, D. M., Atance, C., Meltzoff, A. N., & Loftus, G. R. (2013). Hindsight bias and developing theories of mind. *Child Development*, *78*(4), 1374–94.

Berridge, C. W., & Waterhouse, B. D. (2003). The locus coeruleus–noradrenergic system: modulation of behavioral state and state-dependent cognitive processes. *Brain Research Reviews*, *42*(1), 33–84.

Birch, S. A. J., & Bloom, P. (2004). Understanding children's and adults' limitations in mental state reasoning. *Trends in Cognitive Sciences*, *8*(6), 255–260.

Birch, S. A. J., & Bloom, P. (2007). The curse of knowledge in reasoning about false beliefs. *Psychological Science*, *18*(5), 382–6.

Bless, H. (2001). Mood and the use of general knowledge structures. In G. L. Clore (Ed.), *Theories of mood and cognition: A user's guidebook* (pp. 9–26). Mahwah, NJ, US: Erlbaum Mahwah, NJ.

Bodenhausen, G. V, Sheppard, L. A., & Kramer, G. P. (1994). Negative affect and social judgment: The differential impact of anger and sadness. *European Journal of Social Psychology*, *24*(1), 45–62.

Bosman, R., Sutter, M., & van Winden, F. (2005). The impact of real effort and emotions in the power-to-take game. *Journal of Economic Psychology*, *26*(3), 407–429.

Botvinick, M. M., Braver, T. S., Barch, D. M., Carter, C. S., & Cohen, J. D. (2001). Conflict Monitoring and Cognitive Control. *Psychological Review*, *108*(3), 624–652.

Botvinick, M. M., Cohen, J. D., & Carter, C. S. (2004). Conflict monitoring and anterior cingulate cortex : an update. *Trends in Cognitive Sciences*, *8*(12), 8–12.

Boven, L. Van, Gilovich, T., & Medvec, V. H. (2003). The illusion of transparency in negotiations. *Negotiation Journal*, *19*(2), 117–131.

Brass, M., Bekkering, H., Wohlschläger, A., & Prinz, W. (2000). Compatibility between observed and executed finger movements: comparing symbolic, spatial, and imitative cues. *Brain and Cognition*, *44*(2), 124–43.

Bräuer, J., Call, J., & Tomasello, M. (2004). Visual perspective taking in dogs (< i> Canis familiaris</i>) in the presence of barriers. *Applied Animal Behaviour Science*, *88*(3), 299–317.

Bräuer, J., Call, J., & Tomasello, M. (2007). Chimpanzees really know what others can see in a competitive situation. *Animal Cognition*, *10*(4), 439–448.

Braver, T. S., & Cohen, J. D. (2000). On the Control of Control: The Role of Dopamine in Regulating Prefrontal Function and Working Memory. In S. Monsell & J. S. Driver

(Eds.), *Control of cognitive processes: Attention and performance XVIII* (pp. 713–737). Cambridge, MA: MIT Press.

Briand, L. A., Gritton, H., Howe, W. M., Young, D. A., & Sarter, M. (2007). Modulators in concert for cognition: modulator interactions in the prefrontal cortex. *Progress in Neurobiology*, *83*(2), 69–91.

Brooks, R., & Meltzoff, A. N. (2002). The importance of eyes: How infants interpret adult looking behavior. *Developmental Psychology*, *38*(6), 958.

Brown-Schmidt, S. (2009). The role of executive function in perspective taking during online language comprehension. *Psychonomic Bulletin & Review*, *16*(5), 893–900.

Brüne, M., & Brüne-Cohrs, U. (2006). Theory of mind—evolution, ontogeny, brain mechanisms and psychopathology. *Neuroscience & Biobehavioral Reviews*, *30*(4), 437–455.

Bruneau, E. G., & Saxe, R. (2012). The power of being heard: The benefits of “perspective-giving”in the context of intergroup conflict. *Journal of Experimental Social Psychology*, *48*(4), 855–866.

Bruyer, R., & Brysbaert, M. (2011). Combining Speed and Accuracy in Cognitive Psychology: Is the Inverse Efficiency Score (IES) a Better Dependent Variable than the Mean Reaction Time (RT) and the Percentage Of Errors (PE)? *Psychologica Belgica*, 5–13.

Bukowski, H. (2009). *What executive functions tell us about the cognitive regulation of emotions? A neurocognitive perspective*. Université catholique de Louvain.

Burkart, J. M., & Heschl, A. (2007). Understanding visual access in common marmosets,< i> Callithrix jacchus</i>: perspective taking or behaviour reading? *Animal Behaviour*, *73*(3), 457–469.

Bushman, B. J., & Baumeister, R. F. (1998). Threatened egotism, narcissism, self-esteem, and direct and displaced aggression: does self-love or self-hate lead to violence? *Journal of Personality and Social Psychology*, *75*(1), 219–29.

Buss, D. M., & Chiodo, L. M. (1991). Narcissistic acts in everyday life. *Journal of Personality*, *59*(2), 179–215.

Butler, S. C., Caron, A. J., & Brooks, R. (2000). Infant understanding of the referential nature of looking. *Journal of Cognition and Development*, *1*(4), 359–377.

Buttelmann, D., Carpenter, M., & Tomasello, M. (2009). Eighteen-month-old infants show false belief understanding in an active helping paradigm. *Cognition*, *112*(2), 337–342.

Butterworth, G. (1991). The ontogeny and phylogeny of joint visual attention. In A. Whiten (Ed.), *Natural theories of mind: Evolution, development and simulation of everyday mindreading* (xiv., pp. 222–232). Cambridge, MA, US: Basil Blackwell.

Camerer, C., Loewenstein, G., & Weber, M. (1989). The curse of knowledge in economic settings: An experimental analysis. *The Journal of Political Economy*, 1232–1254.

Campbell, W. K., Bosson, J. K., Goheen, T. W., Lakey, C. E., & Kernis, M. H. (2007). Do narcissists dislike themselves “deep down inside”? *Psychological Science*, *18*(3), 227–9.

Campbell, W. K., Foster, C. a., & Finkel, E. J. (2002). Does self-love lead to love for others?: A story of narcissistic game playing. *Journal of Personality and Social Psychology*, *83*(2), 340–354.

Campbell, W. K., Reeder, G. D., Sedikides, C., & Elliot, A. J. (2000). Narcissism and Comparative Self-Enhancement Strategies. *Journal of Research in Personality*, *34*(3), 329–347.

Campbell, W. K., Rudich, E. a., & Sedikides, C. (2002). Narcissism, Self-Esteem, and the Positivity of Self-Views: Two Portraits of Self-Love. *Personality and Social Psychology Bulletin*, *28*(3), 358–368.

Carlo, G., Allen, J. B., & Buhman, D. C. (1999). Facilitating and disinhibiting prosocial behaviors: The nonlinear interaction of trait perspective taking and trait personal distress on volunteering. *Basic and Applied Social Psychology*, *21*(3), 189–197.

Carlson, S. M., & Moses, L. J. (2001). Individual Differences in Inhibitory Control and Children’s Theory of Mind. *Child Development*, *72*(4), 1032–1053.

Carlson, S. M., Moses, L. J., & Breton, C. (2002). How specific is the relation between executive function and theory of mind? Contributions of inhibitory control and working memory. *Infant and Child Development*, *11*(2), 73–92.

Carlson, S. M., Moses, L. J., & Claxton, L. J. (2004). Individual differences in executive functioning and theory of mind: An investigation of inhibitory control and planning ability. *Journal of Experimental Child Psychology*, *87*(4), 299–319.

Carlson, S. M., Moses, L. J., & Hix, H. R. (1998). The Role of Inhibitory Processes in Young Children’s Difficulties with Deception and False Belief. *Child Development*, *69*(3), 672.

Ceulemans, E., Kuppens, P., & Mechelen, I. Van. (2012). Capturing the Structure of Distinct Types of Individual Differences in the Situation-specific Experience of Emotions: The Case of Anger. *European Journal of Personality*, *26*(5), 484–495.

Chandler, M., Fritz, A. S., & Hala, S. (1989). Small-scale deceit: Deception as a marker of two-, three-, and four-year-olds’ early theories of mind. *Child Development*, 1263–1277.

Chow, R. M., Tiedens, L. Z., & Govan, C. L. (2008). Excluded emotions: The role of anger in antisocial responses to ostracism. *Journal of Experimental Social Psychology*, *44*(3), 896–903.

Christie, R., & Geis, F. L. (1970). *Studies in machiavellianism*. New York: Academic Press.

Clements, W. A., & Perner, J. (1994). Implicit understanding of belief. *Cognitive Development*, *9*(4), 377–395.

Converse, B. A., Lin, S., Keysar, B., & Epley, N. (2008). In the mood to get over yourself: mood affects theory-of-mind use. *Emotion (Washington, D.C.)*, *8*(5), 725–30.

Corbetta, M., & Shulman, G. L. (2002). Control of goal-directed and stimulus-driven attention in the brain. *Nature Reviews. Neuroscience*, *3*(3), 201–15.

Corcoran, K. O., & Mallinckrodt, B. (2000). Adult attachment, self-efficacy, perspective taking, and conflict resolution. *Journal of Counseling & Development*, *78*(4), 473–483.

Cryder, C. E., Springer, S., & Morewedge, C. K. (2012). Guilty feelings, targeted actions. *Personality & Social Psychology Bulletin*, *38*(5), 607–18.

Cunningham, S. J., Turk, D. J., Macdonald, L. M., & Macrae, C. N. (2008). Yours or mine? Ownership and memory. *Consciousness and Cognition*, *17*(1), 312–8.

Davis, M. H. (1980). A multidimensional approach to individual differences in empathy. *JSAS Catalog of Selected Documents in Psychology*, *10*(85).

Davis, M. H. (1983). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology*, *44*(1), 113–126.

Davis, M. H., Conklin, L., Smith, A., & Luce, C. (1996). Effect of perspective taking on the cognitive representation of persons: a merging of self and other. *Journal of Personality and Social Psychology*, *70*(4), 713–26.

Davis, M. H., & Oathout, H. A. (1992). The effect of dispositional empathy on romantic relationship behaviors: Heterosocial anxiety as a moderating influence. *Personality and Social Psychology Bulletin*, *18*(1), 76–83.

De Hooge, I. E., Nelissen, R. M. A., Breugelmans, S. M., & Zeelenberg, M. (2011). What is moral about guilt? Acting “prosocially” at the disadvantage of others. *Journal of Personality and Social Psychology*, *100*(3), 462.

De Hooge, I. E., Zeelenberg, M., & Breugelmans, S. M. (2007). Moral sentiments and cooperation: Differential influences of shame and guilt. *Cognition & Emotion*, *21*(5), 1025–1042.

De Hooge, I. E., Zeelenberg, M., & Breugelmans, S. M. (2010). Restore and protect motivations following shame. *Cognition and Emotion*, *24*(1), 111–127.

De Waal, F. B. M. (2008). Putting the altruism back into altruism: the evolution of empathy. *Annual Review of Psychology*, *59*, 279–300.

Deardorff, P. A., Kendall, P. C., Finch Jr, A. J., & Sitarz, A. M. (1977). Empathy, locus of control and anxiety in college students. *Psychological Reports*, *40*(3c), 1236–1238.

Dehaene, S., Changeux, J.-P., Naccache, L., Sackur, J., & Sergent, C. (2006). Conscious, preconscious, and subliminal processing: a testable taxonomy. *Trends in Cognitive Sciences*, *10*(5), 204–211.

Delič, L., Novak, P., Kovačič, J., & Avsec, A. (2011). Self-reported Emotional and Social Intelligence and Empathy as Distinctive Predictors of Narcissism. *Psihologijske teme/Psychological Topics*, *20*(3), 477–488.

Desimone, R., & Duncan, J. (1995). Neural mechanisms of selective visual attention. *Annual Review of Neuroscience*, *18*(1), 193–222.

Devine, R. T., & Hughes, C. (2014). Relations Between False Belief Understanding and Executive Function in Early Childhood: A Meta-Analysis. *Child Development*, *00*(0), 1–18.

Dimaggio, G., Semerari, A., Falcone, M., Nicolò, G., Carcione, A., & Procacci, M. (2002). Metacognition, states of mind, cognitive biases, and interpersonal cycles: Proposal for an integrated narcissism model. *Journal of Psychotherapy Integration*, *12*(4), 421–451.

Dosenbach, N. U. F., Visscher, K. M., Palmer, E. D., Miezin, F. M., Wenger, K. K., Kang, H. C., … Petersen, S. E. (2006). A Core System for the Implementation of Task Sets. *Neuron*, 799–812.

Dovidio, J. F., ten Vergert, M., Stewart, T. L., Gaertner, S. L., Johnson, J. D., Esses, V. M., … Pearson, A. R. (2004). Perspective and prejudice: Antecedents and mediating mechanisms. *Personality and Social Psychology Bulletin*, *30*(12), 1537–1549.

Downar, J., Crawley, A. P., Mikulis, D. J., Davis, K. D., Müller-oehring, E. M., Jung, Y., … Schlaggar, B. L. (2002). A cortical network sensitive to stimulus salience in a neutral behavioral context across multiple sensory modalities. *Journal of Neurophysiology*, *87*(1), 615–620.

Downing, C. J. (1988). Expectancy and visual-spatial attention: effects on perceptual quality. *Journal of Experimental Psychology: Human Perception and Performance*, *14*(2), 188.

Driver, J., Davis, G., Ricciardelli, P., Kidd, P., Maxwell, E., & Baron-cohen, S. (1999). Gaze Perception Triggers Reflexive Visuospatial Orienting. *Visual Cognition*, *6*(5), 509–540.

Emmons, R. a. (1987). Narcissism: theory and measurement. *Journal of Personality and Social Psychology*, *52*(1), 11–7.

Epley, N., & Caruso, E. M. (2008). Perspective taking: Misstepping into others' shoes. In K. D. Markman, W. M. P. Klein, & J. A. Suhr (Eds.), *Handbook of imagination and mental simulation* (pp. 297–311). Hove, UK: Psychology Press.

Epley, N., Keysar, B., Van Boven, L., & Gilovich, T. (2004). Perspective taking as egocentric anchoring and adjustment. *Journal of Personality and Social Psychology*, *87*(3), 327–39.

Farrant, B. M., Devine, T. A. J., Maybery, M. T., & Fletcher, J. (2012). Empathy, perspective taking and prosocial behaviour: The importance of parenting practices. *Infant and Child Development*, *21*(2), 175–188.

Fennis, B. M. (2011). Can't get over me: Ego depletion attenuates prosocial effects of perspective taking. *European Journal of Social Psychology*, *41*(5), 580–585.

Finkel, E. J., Campbell, W. K., Buffardi, L. E., Kumashiro, M., & Rusbult, C. E. (2009). The metamorphosis of Narcissus: communal activation promotes relationship commitment among narcissists. *Personality & Social Psychology Bulletin*, *35*(10), 1271–84.

Finlay, K. A., & Stephan, W. G. (2000). Improving Intergroup Relations: The Effects of Empathy on Racial Attitudes1. *Journal of Applied Social Psychology*, *30*(8), 1720–1737.

Fischhoff, B. (1975). Hindsight is not equal to foresight: The effect of outcome knowledge on judgment under uncertainty. *Journal of Experimental Psychology: Human Perception and Performance*, *1*(3), 288.

Fizke, E., Barthel, D., Peters, T., & Rakoczy, H. (2014). Executive function plays a role in coordinating different perspectives, particularly when one's own perspective is involved. *Cognition*, *130*(3), 315–34.

Flavell, J. H. (2004). Development of Knowledge about Vision. In D. T. Levin (Ed.), *Thinking and seeing: Visual metacognition in adults and children* (MIT Press., pp. 13–36). Cambridge, MA, US: MIT Press.

Flavell, J. H., Botkin, P., Fry, C., Wright, J., & Jarvis, P. (1968). *The development of role-taking and communication skills in children.* New York, NY: Wiley.

Flavell, J. H., Everett, B. A., Croft, K., & Flavell, E. R. (1981). Young children's knowledge about visual perception: Further evidence for the Level 1–Level 2 distinction. *Developmental Psychology*, *17*(1), 99.

Fodor, J. A. (1992). A theory of the child's theory of mind. *Cognition*, *44*(3), 283–296.

Forgas, J. P. (1995). Mood and judgment: the affect infusion model (AIM). *Psychological Bulletin*, *117*(1), 39–66.

Förster, J., Higgins, E. T., & Bianco, A. T. (2003). Speed/accuracy decisions in task performance: Built-in trade-off or separate strategic concerns? *Organizational Behavior and Human Decision Processes*, *90*(1), 148–164.

Fraley, C., & Raftery, A. E. (1998). How many clusters? Which clustering method? Answers via model-based cluster analysis. *The Computer Journal*, *41*(8), 578–588.

Franco, F., & Butterworth, G. (1996). Pointing and social awareness: Declaring and requesting in the second year. *Journal of Child Language*, *23*(02), 307–336.

Friesen, C. K., & Kingstone, A. (1998a). The eyes have it ! Reflexive orienting is triggered by nonpredictive gaze, *5*(3), 490–495.

Friesen, C. K., & Kingstone, A. (1998b). The eyes have it: Reflexive orienting is triggered by nonpredictive gaze. *Psychonomic Bulletin and Review*, *5*(3), 490–493.

Friesen, C. K., Moore, C., & Kingstone, A. (2005). Does gaze direction really trigger a reflexive shift of spatial attention? *Brain and Cognition*, *57*(1), 66–9.

Frischen, A., Bayliss, A. P., & Tipper, S. P. (2007). Gaze cueing of attention: visual attention, social cognition, and individual differences. *Psychological Bulletin*, *133*(4), 694–724.

Frye, D., Zelazo, P. D., & Palfai, T. (1995). Theory of mind and rule-based reasoning. *Cognitive Development*, *10*(4), 483–527.

Galinsky, A. D., Maddux, W. W., Gilin, D., & White, J. B. (2008). Why it pays to get inside the head of your opponent: the differential effects of perspective taking and empathy in negotiations. *Psychological Science*, *19*(4), 378–84.

Galinsky, A. D., Magee, J. C., Inesi, M. E., & Gruenfeld, D. H. (2006). Power and perspectives not taken. *Psychological Science*, *17*(12), 1068–74.

Galinsky, A. D., & Moskowitz, G. B. (2000). Perspective-taking: Decreasing stereotype expression, stereotype accessibility, and in-group favoritism. *Journal of Personality and Social Psychology*, *78*(4), 708–724.

Galinsky, A. D., Wang, C. S., & Ku, G. (2008). Perspective-takers behave more stereotypically. *Journal of Personality and Social Psychology*, *95*(2), 404.

Gangemi, A., & Mancini, F. (2007). Guilt and focusing in decision-making. *Journal of Behavioral Decision Making*, *20*(1), 1–20.

Garnham, W. A., & Perner, J. (2001). Actions really do speak louder than words—but only implicitly: Young children's understanding of false belief in action. *British Journal of Developmental Psychology*, *19*(3), 413–432.

Gausel, N., & Leach, C. W. (2011). Concern for self-image and social image in the management of moral failure: Rethinking shame. *European Journal of Social Psychology*, *41*(4), 468–478.

Gausel, N., Leach, C. W., Vignoles, V. L., & Brown, R. (2012). Defend or repair? Explaining responses to in-group moral failure by disentangling feelings of shame, rejection, and inferiority. *Journal of Personality and Social Psychology*, *102*(5), 941–60.

Gehlbach, H., Brinkworth, M. E., & Wang, M.-T. (2012). The Social Perspective Taking Process : What Motivates Individuals to Take Another ' s Perspective ? *Teachers College Record*, *114*(1), 197–225.

Gendolla, G. H. E., & Wicklund, R. A. (2009). Self-Focused Attention, Perspective-Taking, and False Consensus. *Social Psychology*, *40*(2), 66–72.

German, T. C., & Cohen, A. S. (2012). A cue-based approach to "theory of mind": Re-examining the notion of automaticity. *The British Journal of Developmental Psychology*, *30*(Pt 1), 45–58.

German, T. P., & Hehman, J. A. (2006). Representational and executive selection resources in "theory of mind": evidence from compromised belief-desire reasoning in old age. *Cognition*, *101*(1), 129–52.

Gilbert, D. T. (1989). Thinking lightly about others: Automatic components of the social inference process. *Unintended Thought*, 189–211.

Gilovich, T., & Savitsky, K. (1999). The Spotlight Effect and the Illusion of Transparency: Egocentric Assessments of How We Are Seen by Others. *Current Directions in Psychological Science*, *8*(6), 165–168.

Gilovich, T., Savitsky, K., Medvec, V. H., Annunziato, A., Bickford, F., Buckley, T., … Steele, S. (1998). The illusion of transparency: biased assessments of others' ability to read one's emotional states. *Journal of Personality and Social Psychology*, *75*(2), 332–46.

Given-Wilson, Z., McIlwain, D., & Warburton, W. (2011). Meta-cognitive and interpersonal difficulties in overt and covert narcissism. *Personality and Individual Differences*, *50*(7), 1000–1005.

Graf, P., & Schacter, D. L. (1985). Implicit and explicit memory for new associations in normal and amnesic subjects. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *11*(3), 501.

Gramzow, R., & Tangney, J. P. (1992). Proneness to shame and the narcissistic personality. *Personality and Social Psychology Bulletin*, *18*(3), 369–376.

Grynberg, D., Luminet, O., Corneille, O., Grèzes, J., & Berthoz, S. (2010). Alexithymia in the interpersonal domain: A general deficit of empathy? *Personality and Individual Differences*, *49*(8), 845–850.

Haidt, J. (2003). The moral emotions. In R. J. Davidson, K. R. Scherer, & H. H. Goldsmith (Eds.), *Handbook of affective sciences* (Oxford Uni., pp. 852–870). New York, NY, US: New York, NY, US: Oxford University Press.

Hall, G. S. (1899). A study of anger. *The American Journal of Psychology*, *10*(4), 516–591.

Hanna, J. E., Tanenhaus, M. K., & Trueswell, J. C. (2003). The effects of common ground and perspective on domains of referential interpretation. *Journal of Memory and Language*, *49*(1), 43–61.

Happé, F. G. (1994). An advanced test of theory of mind: understanding of story characters' thoughts and feelings by able autistic, mentally handicapped, and normal children and adults. *Journal of Autism and Developmental Disorders*, *24*(2), 129–54.

Hare, B., Brown, M., Williamson, C., & Tomasello, M. (2002). The domestication of social cognition in dogs. *Science*, *298*(5598), 1634–1636.

Hare, B., Call, J., Agnetta, B., & Tomasello, M. (2000). Chimpanzees know what conspecifics do and do not see. *Animal Behaviour*, *59*(4), 771–785.

Harth, N. S., Leach, C. W., & Kessler, T. (2013). Guilt, anger, and pride about in-group environmental behaviour: Different emotions predict distinct intentions. *Journal of Environmental Psychology*, *34*, 18–26.

Harton, H. C., & Lyons, P. C. (2003). Gender, empathy, and the choice of the psychology major. *Teaching of Psychology*, *30*(1), 19–24.

Hass, R. G. (1984). Perspective Taking and Self-Awareness : Drawing an E on Your Forehead. *Journal of Personality and Social Psychology*, *46*(4), 788–798.

Hayward, D. a, & Ristic, J. (2013). The uniqueness of social attention revisited: working memory load interferes with endogenous but not social orienting. *Experimental Brain Research*, *231*(4), 405–14.

Hazy, T. E., Frank, M. J., & O'Reilly, R. C. (2007). Towards an executive without a homunculus: computational models of the prefrontal cortex/basal ganglia system.

Philosophical Transactions of the Royal Society B: Biological Sciences, *362*(1485), 1601–1613.

Heller, D., Gorman, K. S., & Tanenhaus, M. K. (2012). To name or to describe: shared knowledge affects referential form. *Topics in Cognitive Science*, *4*(2), 290–305.

Hepper, E. G., Hart, C. M., Meek, R., Cisek, S., & Sedikides, C. (2014). Narcissism and Empathy in Young Offenders and Non-offenders. *European Journal of Personality*, *28*(2), 201–210.

Hepper, E. G., Hart, C. M., & Sedikides, C. (2014). Moving Narcissus: Can Narcissists Be Empathic? *Personality & Social Psychology Bulletin*.

Heyes, C. (2014a). False belief in infancy: a fresh look. *Developmental Science*.

Heyes, C. (2014b). Submentalizing: I Am Not Really Reading Your Mind. *Perspectives on Psychological Science*, *9*(2), 131–143.

Hietanen, J. K. (1999). Does your gaze direction and head orientation shift my visual attention? *Neuroreport*, *10*(16), 3443–3447.

Hietanen, J. K. (2002). Social attention orienting integrates visual information from head and body orientation. *Psychological Research*, *66*(3), 174–9.

Hood, B. M., Willen, J. D., & Driver, J. (1998). Adult's eyes trigger shifts of visual attention in human infants. *Psychological Science*, *9*(2), 131–134.

Hooge, I. E. De, Breugelmans, S. M., Zeelenberg, M., & De Hooge, I. E. (2008). Not so ugly after all: when shame acts as a commitment device. *Journal of Personality and Social Psychology*, *95*(4), 933.

Hopfensitz, A., & Reuben, E. (2009). The importance of emotions for the effectiveness of social punishment. *The Economic Journal*, *119*(540), 1534–1559.

Horberg, E. J., Oveis, C., & Keltner, D. (2011). Emotions as Moral Amplifiers: An Appraisal Tendency Approach to the Influences of Distinct Emotions upon Moral Judgment. *Emotion Review*, *3*(3), 237–244.

Horton, W. S., & Keysar, B. (1996). When do speakers take into account common ground? *Cognition*, *59*(1), 91–117.

Hughes, C., & Ensor, R. (2007). Executive function and theory of mind: Predictive relations from ages 2 to 4. *Developmental Psychology*, *43*(6), 1447–59.

Hughes, C., Jaffee, S. R., Happé, F., Taylor, A., Caspi, A., & Moffitt, T. E. (2012). Origins of individual differences in theory of mind: from nature to nurture? *Child Development*, *76*(2), 356–70.

Itti, L., & Koch, C. (2000). A saliency-based search mechanism for overt and covert shifts of visual attention. *Vision Research*, *40*(10), 1489–1506.

Iyer, A., & Leach, C. W. (2009). Emotion in inter-group relations. *European Review of Social Psychology*, *19*(1), 86–125.

Iyer, A., Leach, C. W., & Crosby, F. J. (2003). White guilt and racial compensation: the benefits and limits of self-focus. *Personality & Social Psychology Bulletin*, *29*(1), 117–29.

Izard, C. E., & Ackerman, B. P. (2000). Motivational, organizational, and regulatory functions of discrete emotions. *Handbook of Emotions*, *2*, 253–264.

Izard, C. E., Libero, D. Z., Putnam, P., & Haynes, O. M. (1993). Stability of emotion experiences and their relations to traits of personality. *Journal of Personality and Social Psychology*, *64*(5), 847.

Joireman, J. (2004). Empathy and the Self-Absorption Paradox II: Self-Rumination and Self-Reflection as Mediators Between Shame, Guilt, and Empathy. *Self and Identity*, *3*(3), 225–238.

Jonason, P. K., & Krause, L. (2013). The emotional deficits associated with the Dark Triad traits: Cognitive empathy, affective empathy, and alexithymia. *Personality and Individual Differences*, *55*(5), 532–537.

Jonides, J., & Yantis, S. (1988). Uniqueness of abrupt visual onset in capturing attention. *Perception & Psychophysics*, *43*(4), 346–354.

Kaland, C., Krahmer, E., & Swerts, M. (2011). Salient in the mind, salient in prosody. In *Proceedings of the 33rd Annual Conference of the Cognitive Science Society* (pp. 261–266).

Kaminski, J., Riedel, J., Call, J., & Tomasello, M. (2005). Domestic goats,< i> Capra hircus</i>, follow gaze direction and use social cues in an object choice task. *Animal Behaviour*, *69*(1), 11–18.

Keltner, D. (1996). Evidence for the Distinctness of Embarrassment, Shame, and Guilt: A Study of Recalled Antecedents and Facial Expressions of Emotion. *Cognition & Emotion*, *10*(2), 155–172.

Kerr, N. (2003). Theory of mind deficits in bipolar affective disorder. *Journal of Affective Disorders*, *73*(3), 253–259.

Kessler, K., & Rutherford, H. (2010). The two forms of visuo-spatial perspective taking are differently embodied and subserve different spatial prepositions. *Frontiers in Psychology*, *1*(December), 1–12.

Ketelaar, T., Tung Au, W., & Au, W. T. (2003). The effects of feelings of guilt on the behaviour of uncooperative individuals in repeated social bargaining games: An affect-as-information interpretation of the role of emotion in social interaction. *Cognition & Emotion*, *17*(3), 429–453.

Keysar, B. (1994). The illusory transparency of intention: Linguistic perspective taking in text. *Cognitive Psychology*, *26*(2), 165–208.

Keysar, B., Barr, D. J., Balin, J. A., & Brauner, J. S. (2000). Taking perspective in conversation: The role of mutual knowledge in comprehension. *Psychological Science*, *11*(1), 32–38.

Keysar, B., & Bly, B. (1995). Intuitions of the transparency of idioms: can one keep a secret by spilling the beans? *Journal of Memory and Language*, *34*(1), 89–109.

Keysar, B., Ginzel, L. E., & Bazerman, M. H. (1995). States of affairs and states of mind: The effect of knowledge of beliefs. *Organizational Behavior and Human Decision Processes*, *64*(3), 283–293.

Keysar, B., Lin, S., & Barr, D. J. (2003). Limits on theory of mind use in adults. *Cognition*, *89*(1), 25–41.

Kouider, S., & Dehaene, S. (2007). Levels of processing during non-conscious perception: a critical review of visual masking. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *362*(1481), 857–875.

Kovács, Á. M., Téglás, E., & Endress, A. D. (2010). The Social Sense: Susceptibility to Others' Beliefs in Human Infants and Adults. *Science*, *330*(6012), 1830–1834.

Krueger, J., & Clement, R. W. (1994). The truly false consensus effect: an ineradicable and egocentric bias in social perception. *Journal of Personality and Social Psychology*, *67*(4), 596.

Ku, G., Wang, C. S., & Galinsky, A. D. (2010). Perception through a perspective-taking lens: Differential effects on judgment and behavior. *Journal of Experimental Social Psychology*, *46*(5), 792–798.

Lachat, F., Conty, L., Hugueville, L., & George, N. (2012). Gaze Cueing Effect in a Face-to-Face Situation. *Journal of Nonverbal Behavior*, *36*(3), 177–190.

Lane, L. W., & Ferreira, V. S. (2008). Speaker-external versus speaker-internal forces on utterance form: Do cognitive demands override threats to referential success? *Journal of Experimental Psychology: Learning, Memory, and Cognition*, *34*(6), 1466.

Lane, L. W., Groisman, M., & Ferreira, V. S. (2006). Don't talk about pink elephants! Speaker's control over leaking private information during language production. *Psychological Science*, *17*(4), 273–7.

Lane, L. W., & Liersch, M. J. (2012). Can you keep a secret? Increasing speakers' motivation to keep information confidential yields poorer outcomes. *Language and Cognitive Processes*, *27*(3), 462–473.

Langdon, R., & Coltheart, M. (1999). Mentalising, schizotypy, and schizophrenia. *Cognition*, *71*(1), 43–71.

Langdon, R., & Coltheart, M. (2001). Visual perspective-taking and schizotypy: evidence for a< i> simulation</i>-based account of mentalizing in normal adults. *Cognition*, *82*(1), 1–26.

Langdon, R., Coltheart, M., Ward, P. B., & Catts, S. V. (2001). Visual and cognitive perspective-taking impairments in schizophrenia: A failure of allocentric simulation? *Cognitive Neuropsychiatry*, *6*(4), 241–269.

Langton, S. R. H. (2000). The mutual influence of gaze and head orientation in the analysis of social attention direction. *The Quarterly Journal of Experimental Psychology. A, Human Experimental Psychology*, *53*(3), 825–45.

Langton, S. R. H., & Bruce, V. (1999). Reflexive Visual Orienting in Response to the Social Attention of Others. *Visual Cognition*, *6*(5), 541–567.

Langton, S. R. H., Watt, R., & Bruce, I. (2000). Do the eyes have it? Cues to the direction of social attention. *Trends in Cognitive Sciences*, *4*(2), 50–59.

Lassiter, C. L. (2012). *The effects of guilt on young children's cognitive processing* (Master's thesis). University of North Carolina at Greensboro. Retrieved from http://libres.uncg.edu/ir/uncg/f/Lassiter_uncg_0154M_10854.pdf

Laurent, S. M., & Myers, M. W. (2011). I know you're me, but who am I? Perspective taking and seeing the other in the self. *Journal of Experimental Social Psychology*, *47*(6), 1316–1319.

Law, A. S., Langton, S. R. H., & Logie, R. H. (2010). Assessing the impact of verbal and visuospatial working memory load on eye-gaze cueing. *Visual Cognition*, *18*(10), 1420–1438.

Lawrence, E. J., Shaw, P., Baker, D., Baron-Cohen, S., & David, a S. (2004). Measuring empathy: reliability and validity of the Empathy Quotient. *Psychological Medicine*, *34*(5), 911–9.

Lee, L., Harkness, K. L., Sabbagh, M. A., & Jacobson, J. A. (2005). Mental state decoding abilities in clinical depression. *Journal of Affective Disorders*, *86*(2-3), 247–58.

Leith, K. P., & Baumeister, R. F. (1998). Empathy, Shame, Guilt, and Narratives of Interpersonal Conflicts : Guilt-Prone People Are Better at Perspective Taking. *Journal of Personality*, *66*(1), 1–37.

Lempers, J. D., Flavell, E. R., & Flavell, J. H. (1977). The development in very young children of tacit knowledge concerning visual perception. *Genetic Psychology Monographs*, *95*(1), 3–53.

Lerner, J. S., & Tiedens, L. Z. (2006). Portrait of the angry decision maker: how appraisal tendencies shape anger's influence on cognition. *Journal of Behavioral Decision Making*, *19*(2), 115–137.

Leslie, A. M. (1987). Pretense and representation: The origins of "theory of mind." *Psychological Review*, *94*(4), 412–426.

Leslie, A. M., Friedman, O., & German, T. P. (2004). Core mechanisms in "theory of mind". *Trends in Cognitive Sciences*, *8*(12), 528–33.

Leslie, A. M., & Frith, U. (1988). Autistic children's understanding of seeing, knowing and believing. *British Journal of Developmental Psychology*, *6*(4), 315–324.

Leslie, A. M., German, T. P., & Polizzi, P. (2005). Belief-desire reasoning as a process of selection. *Cognitive Psychology*, *50*(1), 45–85.

Lewis, H. B. (1971). Shame and guilt in neurosis. *Psychoanalytic Review*, *58*(3), 419–438.

Lin, S., Keysar, B., & Epley, N. (2010). Reflexively mindblind: Using theory of mind to interpret behavior requires effortful attention. *Journal of Experimental Social Psychology*, *46*(3), 551–556.

Lindsay-Hartz, J. (1984). Contrasting Experiences of Shame and Guilt. *American Behavioral Scientist*, *27*(6), 689–704.

Loudin, J. L., Loukas, A., & Robinson, S. (2003). Relational aggression in college students: Examining the roles of social anxiety and empathy. *Aggressive Behavior*, *29*(5), 430–439.

Low, J. (2010). Preschoolers' Implicit and Explicit False-Belief Understanding: Relations With Complex Syntactical Mastery. *Child Development*, *81*(2), 597–615.

Lynd, H. M. (1958). *On shame and the search for identity*. New York: Harcourt, Brace.

Mansfield, E., Farroni, T., & Johnson, M. (2003). Does gaze perception facilitate overt orienting? *Visual Cognition*, *10*(1), 7–14.

Martin, R., Wan, C. K., David, J. P., Wegner, E. L., Olson, B. D., & Watson, D. (1999). Style of anger expression: Relation to expressivity, personality, and health. *Personality and Social Psychology Bulletin*, *25*(10), 1196–1207.

Masangkay, Z. S., McCluskey, K. A., McIntyre, C. W., Sims-Knight, J., Vaughn, B. E., & Flavell, J. H. (1974). The early development of inferences about the visual percepts of others. *Child Development*, 357–366.

Maurer, D. (1985). Infants' perception of facedness. In T. Field & N. Fox (Eds.), *Social perception in infants* (pp. 73–100). Norwood, NJ: Ablex.

Mavritsaki, E., Allen, H. A., & Humphreys, G. W. (2010). Decomposing the neural mechanisms of visual search through model-based analysis of fMRI: top-down excitation, active ignoring and the use of saliency by the right TPJ. *NeuroImage*, *52*(3), 934–46.

McCleery, J. P., Surtees, A. D. R., Graham, K. A., Richards, J. E., & Apperly, I. A. (2011). The neural and cognitive time course of theory of mind. *The Journal of Neuroscience : The Official Journal of the Society for Neuroscience*, *31*(36), 12849–54.

Meert, G., & Samson, D. (2013). The implicit processing of beliefs: Toward an understanding of its triggering conditions. In *18th Conference of the European Society for Cognitive Psychology (ESCOP)*.

Michelon, P., & Zacks, J. M. (2006). Two kinds of visual perspective taking. *Perception & Psychophysics*, *68*(2), 327–337.

Miller, E. K. (2000). The prefrontal cortex and cognitive control. *Nature Reviews. Neuroscience*, *1*(1), 59–65.

Mitchell, P., Currie, G., & Ziegler, F. (2009). Two routes to perspective: Simulation and rule-use as approaches to mentalizing. *British Journal of Developmental Psychology*, *27*(3), 513–543.

Miyake, a, Friedman, N. P., Emerson, M. J., Witzki, a H., Howerter, a, & Wager, T. D. (2000). The unity and diversity of executive functions and their contributions to complex "Frontal Lobe" tasks: a latent variable analysis. *Cognitive Psychology*, *41*(1), 49–100.

Mohr, P., Howells, K., Gerace, A., Day, A., & Wharton, M. (2007). The role of perspective taking in anger arousal. *Personality and Individual Differences*, *43*(3), 507–517.

Moll, H., & Tomasello, M. (2006). Level 1 perspective-taking at 24 months of age. *British Journal of Developmental Psychology*, *24*(3), 603–613.

Montag, C., Schubert, F., Heinz, A., & Gallinat, J. (2008). Prefrontal cortex glutamate correlates with mental perspective-taking. *PloS One*, *3*(12), e3890.

Morf, C. C., Horvath, S., & Torchetti, L. (2011). Narcissistic selfenhancement: Tales of (Successful?) self-portrayal. In M. D. Alicke & C. Sedikides (Eds.), *Handbook of self-enhancement and self-protection* (pp. 399–424). New York, NY, US: Guilford Press.

Morf, C. C., & Rhodewalt, F. (2001). Unraveling the paradoxes of narcissism: A dynamic self-regulatory processing model. *Psychological Inquiry*, *12*(4), 177–196.

Mudrik, L., Breska, A., Lamy, D., & Deouell, L. Y. (2011). Integration without awareness: expanding the limits of unconscious processing. *Psychological Science*, *22*(6), 764–70.

Mulckhuyse, M., & Theeuwes, J. (2010). Unconscious attentional orienting to exogenous cues: A review of the literature. *Acta Psychologica*, *134*(3), 299–309.

Müller, B. C. N., Kühn, S., van Baaren, R. B., Dotsch, R., Brass, M., & Dijksterhuis, A. (2011). Perspective taking eliminates differences in co-representation of out-group members' actions. *Experimental Brain Research*, *211*(3-4), 423–428.

Munro, D., Bore, M., & Powis, D. (2005). Personality factors in professional ethical behaviour: Studies of empathy and narcissism. *Australian Journal of Psychology*, *57*(1), 49–60.

Nathan DeWall, C., Buffardi, L. E., Bonser, I., & Keith Campbell, W. (2011). Narcissism and implicit attention seeking: Evidence from linguistic analyses of social networking and online presentation. *Personality and Individual Differences*, *51*(1), 57–62.

Negd, M., Mallan, K. M., & Lipp, O. V. (2011). The role of anxiety and perspective-taking strategy on affective empathic responses. *Behaviour Research and Therapy*, *49*(12), 852–7.

Nelissen, R. M. A., Dijker, A., & Devries, N. (2007). How to turn a hawk into a dove and vice versa: Interactions between emotions and goals in a give-some dilemma game. *Journal of Experimental Social Psychology*, *43*(2), 280–286.

Nelissen, R. M. A., Leliveld, M. C., van Dijk, E., & Zeelenberg, M. (2011). Fear and guilt in proposers: Using emotions to explain offers in ultimatum bargaining. *European Journal of Social Psychology*, *41*(1), 78–85.

Nelissen, R. M. A., & Zeelenberg, M. (2009a). Moral emotions as determinants of third-party punishment: Anger, guilt, and the functions of altruistic sanctions. *Judgment and Decision Making*, *4*(7), 543–553.

Nelissen, R. M. A., & Zeelenberg, M. (2009b). When guilt evokes self-punishment: evidence for the existence of a Dobby Effect. *Emotion (Washington, D.C.)*, *9*(1), 118–22.

Newton, A. M., & de Villiers, J. G. (2007). Thinking while talking: adults fail nonverbal false-belief reasoning. *Psychological Science*, *18*(7), 574–9.

Nilsen, E. S., & Graham, S. a. (2009). The relations between children’s communicative perspective-taking and executive functioning. *Cognitive Psychology*, *58*(2), 220–49.

O’Brien, E., Konrath, S. H., Grühn, D., & Hagen, A. L. (2013). Empathic concern and perspective taking: Linear and quadratic effects of age across the adult life span. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *68*(2), 168–175.

Onishi, K. H., & Baillargeon, R. (2005). Do 15-month-old infants understand false beliefs? *Science*, *308*(5719), 255–8.

Paulhus, D. L., & Williams, K. M. (2002). The dark triad of personality: Narcissism, Machiavellianism, and psychopathy. *Journal of Research in Personality*, *36*(6), 556–563.

Perner, J. (1995). The many faces of belief: Reflections on Fodor’s and the child's theory of mind. *Cognition*, *57*(3), 241–269.

Perner, J., & Lang, B. (1999). Development of theory of mind and executive control. *Trends in Cognitive Sciences*, *3*(9), 337–344.

Piaget, J., & Inhelder, B. (1948). *La représentation de l’espace chez l'enfant.* (p. 581). Paris: Presses universitaires de France.

Pillutla, M. M., & Murnighan, J. K. (1996). Unfairness, Anger, and Spite: Emotional Rejections of Ultimatum Offers. *Organizational Behavior and Human Decision Processes*, *68*(3), 208–224.

Pomianowska, I., Germeys, F., Verfaillie, K., & Newell, F. N. (2011). The role of social cues in the deployment of spatial attention: head-body relationships automatically activate directional spatial codes in a Simon task. *Frontiers in Integrative Neuroscience*, *6*(February), 4.

Posner, M. I. (1980). Orienting of attention. *Quarterly Journal of Experimental Psychology*, *32*(1), 3–25.

Pratto, F., Sidanius, J., Stallworth, L. M., & Malle, B. F. (1994). Social dominance orientation: A personality variable predicting social and political attitudes. *Journal of Personality and Social Psychology*, *67*(4), 741–763.

Premack, D., & Woodruff, G. (1978). Does the chimpanzee have a theory of mind? *Behavioral and Brain Sciences*, *1*(04), 515–526.

Preston, S. D., & de Waal, F. B. M. (2002). Empathy: Its ultimate and proximate bases. *The Behavioral and Brain Sciences*, *25*(1), 1–20; discussion 20–71.

Qureshi, A. W., Apperly, I. A., & Samson, D. (2010). Executive function is necessary for perspective selection, not Level-1 visual perspective calculation: evidence from a dual-task study of adults. *Cognition*, *117*(2), 230–6.

Ramsey, R., Hansen, P., Apperly, I. A., & Samson, D. (2013). Seeing it my way or your way: frontoparietal brain areas sustain viewpoint-independent perspective selection processes. *Journal of Cognitive Neuroscience*, *25*(5), 670–84.

Raskin, R., & Terry, H. (1988). A principal-components analysis of the Narcissistic Personality Inventory and further evidence of its construct validity. *Journal of Personality and Social Psychology*, *54*(5), 890–902.

Regan, J. W. (1971). Guilt, perceived injustice, and altruistic behavior. *Journal of Personality and Social Psychology*, *18*(1), 124–32.

Richardson, D. R., Hammock, G. S., Smith, S. M., Gardner, W., & Signo, M. (1994). Empathy as a cognitive inhibitor of interpersonal aggression. *Aggressive Behavior*, *20*(4), 275–289.

Ridderinkhof, K. R., van den Wildenberg, W. P. M., Segalowitz, S. J., & Carter, C. S. (2004). Neurocognitive mechanisms of cognitive control: the role of prefrontal cortex in action selection, response inhibition, performance monitoring, and reward-based learning. *Brain and Cognition*, *56*(2), 129–40.

Ritter, K., Dziobek, I., Preissler, S., Rüter, A., Vater, A., Fydrich, T., … Roepke, S. (2011). Lack of empathy in patients with narcissistic personality disorder. *Psychiatry Research*, *187*(1-2), 241–7.

Rizkalla, L., Wertheim, E. H., & Hodgson, L. K. (2008). The roles of emotion management and perspective taking in individuals' conflict management styles and disposition to forgive. *Journal of Research in Personality*, *42*(6), 1594–1601.

Rogers, T. B., Kuiper, N. A., & Kirker, W. S. (1977). Self-reference and the encoding of personal information. *Journal of Personality and Social Psychology*, *35*(9), 677.

Ross, L., Greene, D., & House, P. (1977). The "false consensus effect": An egocentric bias in social perception and attribution processes. *Journal of Experimental Social Psychology*, *13*(3), 279–301.

Royzman, E. B., Cassidy, K. W., & Baron, J. (2003). "I know, you know": Epistemic egocentrism in children and adults. *Review of General Psychology*, *7*(1), 38–65.

Ruffman, T., Garnham, W., Import, A., & Connolly, D. (2001). Does eye gaze indicate implicit knowledge of false belief? Charting transitions in knowledge. *Journal of Experimental Child Psychology*, *80*(3), 201–224.

Rushworth, M. F. S., Walton, M. E., Kennerley, S. W., & Bannerman, D. M. (2004). Action sets and decisions in the medial frontal cortex. *Trends in Cognitive Sciences*, *8*(9).

Rutherford, M. D. (2004). The effect of social role on theory of mind reasoning. *British Journal of Psychology*, *95*(1), 91–103.

Sabbagh, M. A., Moses, L. J., & Shiverick, S. (2006). Executive functioning and preschoolers' understanding of false beliefs, false photographs, and false signs. *Child Development*, *77*(4), 1034–49.

Samson, D., Apperly, I. A., Braithwaite, J. J., Andrews, B. J., Scott, S. E. B., & Bodley Scott, S. E. (2010). Seeing it their way: evidence for rapid and involuntary computation of what other people see. *Journal of Experimental Psychology. Human Perception and Performance*, *36*(5), 1255–66.

Samson, D., Apperly, I. A., Kathirgamanathan, U., & Humphreys, G. W. (2005). Seeing it my way : a case of a selective deficit in inhibiting self-perspective. *Brain*, *128*(Pt 5), 1102–1111.

Santiesteban, I., Banissy, M. J., Catmur, C., & Bird, G. (2012). Enhancing social ability by stimulating right temporoparietal junction. *Current Biology : CB*, *22*(23), 2274–7.

Santiesteban, I., Catmur, C., Coughlan Hopkins, S., Bird, G., & Heyes, C. (2013). Avatars and Arrows: Implicit Mentalizing or Domain-General Processing? *Journal of Experimental Psychology. Human Perception and Performance*, *39*(6), 1–9.

Satpute, A. B., & Lieberman, M. D. (2006). Integrating automatic and controlled processes into neurocognitive models of social cognition. *Brain Research*, *1079*(1), 86–97.

Scaffidi Abbate, C., Isgró, A., Wicklund, R. A., & Boca, S. (2006). A Field Experiment on Perspective-Taking, Helping, and Self-Awareness. *Basic and Applied Social Psychology*, *28*(3), 283–287.

Scherer, K. R., & Wallbott, H. G. (1994). Evidence for universality and cultural variation of differential emotion response patterning. *Journal of Personality and Social Psychology*, *66*(2), 310.

Schneider, D., Nott, Z. E., & Dux, P. E. (2014). Task instructions and implicit theory of mind. *Cognition*, *133*(1), 43–47.

Schneider, D., Slaughter, V. P., & Dux, P. E. (2014). What do we know about implicit false-belief tracking? *Psychonomic Bulletin & Review*, 1–12.

Scholl, B. J., & Leslie, A. M. (2001). Minds, modules, and meta-analysis. *Child Development*, *72*(3), 696–701.

Schröder-Abé, M., & Schütz, A. (2011). Walking in each other's shoes: Perspective taking mediates effects of emotional intelligence on relationship quality. *European Journal of Personality*, *25*(2), 155–169.

Schurz, M., Aichhorn, M., Martin, A., & Perner, J. (2013). Common brain areas engaged in false belief reasoning and visual perspective taking: a meta-analysis of functional brain imaging studies. *Frontiers in Human Neuroscience*, *7*(November), 712.

Schwarz, G. (1978). Estimating the dimension of a model. *The Annals of Statistics*, *6*(2), 461–464.

Sebanz, N., Knoblich, G., & Prinz, W. (2003). Representing others' actions: just like one's own? *Cognition*, *88*(3), B11–B21.

Segrin, C. (2000). Social skills deficits associated with depression. *Clinical Psychology Review*, *20*(3), 379–403.

Senju, A., Southgate, V., Snape, C., Leonard, M., & Csibra, G. (2011). Do 18-month-olds really attribute mental states to others? A critical test. *Psychological Science*, *22*(7), 878–880.

Senju, A., Southgate, V., White, S., & Frith, U. (2009). Mindblind eyes: an absence of spontaneous theory of mind in Asperger syndrome. *Science (New York, N.Y.)*, *325*(5942), 883–5.

Shamay-Tsoory, S. G., Aharon-Peretz, J., & Perry, D. (2009). Two systems for empathy: a double dissociation between emotional and cognitive empathy in inferior frontal gyrus versus ventromedial prefrontal lesions. *Brain : A Journal of Neurology*, *132*(Pt 3), 617–27.

Shillito, D. J., Shumaker, R. W., Gallup Jr, G. G., & Beck, B. B. (2005). Understanding visual barriers: evidence for Level 1 perspective taking in an orang-utan,< i> Pongo pygmaeus</i>. *Animal Behaviour*, *69*(3), 679–687.

Silani, G., Lamm, C., Ruff, C. C., & Singer, T. (2013). Right supramarginal gyrus is crucial to overcome emotional egocentricity bias in social judgments. *The Journal of Neuroscience : The Official Journal of the Society for Neuroscience*, *33*(39), 15466–76.

Simon, J. R. (1969). Reactions toward the source of stimulation. *Journal of Experimental Psychology*, *81*(1), 174.

Singer, T., Seymour, B., O'Doherty, J. P., Stephan, K. E., Dolan, R. J., & Frith, C. D. (2006). Empathic neural responses are modulated by the perceived fairness of others. *Nature*, *439*(7075), 466–469.

Skorinko, J. L., & Sinclair, S. A. (2013). Perspective taking can increase stereotyping: The role of apparent stereotype confirmation. *Journal of Experimental Social Psychology*, *49*(1), 10–18.

Smith, C. a, & Ellsworth, P. C. (1985). Patterns of cognitive appraisal in emotion. *Journal of Personality and Social Psychology*, *48*(4), 813–38.

Smith, R. H., Webster, J. M., Parrott, W. G., & Eyre, H. L. (2002). The role of public exposure in moral and nonmoral shame and guilt. *Journal of Personality and Social Psychology*, *83*(1), 138–159.

Sodian, B., Thoermer, C., & Metz, U. (2007). Now I see it but you don't: 14-month-olds can represent another person's visual perspective. *Developmental Science*, *10*(2), 199–204.

Song, H., & Baillargeon, R. (2008). Infants' reasoning about others' false perceptions. *Developmental Psychology*, *44*(6), 1789.

Song, H., Onishi, K. H., Baillargeon, R., & Fisher, C. (2008). Can an agent's false belief be corrected by an appropriate communication? Psychological reasoning in 18-month-old infants. *Cognition*, *109*(3), 295–315.

Southgate, V., Chevallier, C., & Csibra, G. (2010). Seventeen-month-olds appeal to false beliefs to interpret others' referential communication. *Developmental Science*, *13*(6), 907–912.

Southgate, V., Senju, A., & Csibra, G. (2007). Action anticipation through attribution of false belief by 2-year-olds. *Psychological Science*, *18*(7), 587–592.

Spielberger, C. D. (1983). *Manual for the State–Trait Anxiety Inventory: STAI (Form Y)*. Palo Alto, CA: Consulting Psychologists Press, Inc.

Spielberger, C. D., Krasner, S. S., & Solomon, E. P. (1988). The experience, expression, and control of anger. In M. P. Janisse (Ed.), *Individual differences, stress, and health psychology* (pp. 89–108). New York: Springer-Verlag.

Stephenson, B., & Wicklund, R. A. (1983). Self-directed attention and taking the other's perspective. *Journal of Experimental Social Psychology*, *19*(1), 58–77.

Stephenson, B., & Wicklund, R. A. (1984). The Contagion of Self-Focus Within a Dyad. *Journal of Personality and Social Psychology*, *46*(1983), 163–168.

Sui, J., Chechlacz, M., Rotshtein, P., & Humphreys, G. W. (2013). Lesion-Symptom Mapping of Self-Prioritization in Explicit Face Categorization: Distinguishing Hypo- and Hyper-Self-Biases. *Cerebral Cortex (New York, N.Y. : 1991)*, bht233.

Sui, J., He, X., & Humphreys, G. W. (2012). Perceptual effects of social salience: evidence from self-prioritization effects on perceptual matching. *Journal of Experimental Psychology. Human Perception and Performance*, *38*(5), 1105–17.

Sui, J., Rotshtein, P., & Humphreys, G. W. (2013). Coupling social attention to the self forms a network for personal significance. *Proceedings of the National Academy of Sciences of the United States of America*, *110*(19), 7607–12.

Surian, L., Caldi, S., & Sperber, D. (2007). Attribution of beliefs by 13-month-old infants. *Psychological Science*, *18*(7), 580–586.

Surtees, A., Apperly, I., & Samson, D. (2013). The use of embodied self-rotation for visual and spatial perspective-taking. *Frontiers in Human Neuroscience*, *7*(November), 698.

Surtees, A. D. R., & Apperly, I. A. (2012). Egocentrism and automatic perspective taking in children and adults. *Child Development*, *83*(2), 452–60.

Surtees, A. D. R., Apperly, I. A., & Samson, D. (2013). Similarities and differences in visual and spatial perspective-taking processes. *Cognition*, *129*(2), 426–38.

Tamir, D. I., & Mitchell, J. P. (2010). Neural correlates of anchoring-and-adjustment during mentalizing. *Proceedings of the National Academy of Sciences*, *107*(24), 10827–10832.

Tangney, J. P. (1995). Recent Advances in the Empirical Study of Shame and Guilt. *American Behavioral Scientist*, *38*(8), 1132–1145.

Tangney, J. P., Miller, R. S., Flicker, L., & Barlow, D. H. (1996). Are shame, guilt, and embarrassment distinct emotions? *Journal of Personality and Social Psychology*, *70*(6), 1256–69.

Taylor, M., & Carlson, S. M. (1997). The relation between individual differences in fantasy and theory of mind. *Child Development*, *68*(3), 436–55.

Teufel, C., Alexis, D. M., Clayton, N. S., & Davis, G. (2010). Mental-state attribution drives rapid, reflexive gaze following. *Attention, Perception & Psychophysics*, *72*(3), 695–705.

Theeuwes, J. (1992). Perceptual selectivity for color and form. *Perception & Psychophysics*, *51*(6), 599–606.

Theeuwes, J., & Burger, R. (1998). Attentional control during visual search: the effect of irrelevant singletons. *Journal of Experimental Psychology: Human Perception and Performance*, *24*(5), 1342.

Tiedens, L. Z., & Linton, S. (2001). Judgment under emotional certainty and uncertainty: The effects of specific emotions on information processing. *Journal of Personality and Social Psychology*, *81*(6), 973–988.

Todd, A. R., Bodenhausen, G. V, & Galinsky, A. D. (2012). Perspective taking combats the denial of intergroup discrimination. *Journal of Experimental Social Psychology*, *48*(3), 738–745.

Todd, A. R., Bodenhausen, G. V, Richeson, J. A., & Galinsky, A. D. (2011). Perspective taking combats automatic expressions of racial bias. *Journal of Personality and Social Psychology*, *100*(6), 1027.

Todd, A. R., & Burgmer, P. (2013). Perspective taking and automatic intergroup evaluation change: Testing an associative self-anchoring account. *Journal of Personality and Social Psychology*, *104*(5), 786.

Todd, A. R., & Galinsky, A. D. (2012). The reciprocal link between multiculturalism and perspective-taking: How ideological and self-regulatory approaches to managing diversity reinforce each other. *Journal of Experimental Social Psychology*, *48*(6), 1394–1398.

Todd, A. R., & Galinsky, A. D. (2014). Perspective-Taking as a Strategy for Improving Intergroup Relations: Evidence, Mechanisms, and Qualifications. *Social and Personality Psychology Compass*, *8*(7), 374–387.

Todd, A. R., Hanko, K., Galinsky, A. D., & Mussweiler, T. (2011). When focusing on differences leads to similar perspectives. *Psychological Science*, *22*(1), 134–41.

Townsend, J. T., & Ashby, F. G. (1978). Methods of modeling capacity in simple processing systems. *Cognitive Theory*, *3*, 200–239.

Tracy, J. L., & Robins, R. W. (2003). Self-Conscious Emotions: Where Self and Emotion Meet. In C. Sedikides & S. J. Spencer (Eds.), *The self. Frontiers of social psychology* (xii., pp. 187–209). New York, NY, US: Psychology Press.

Tracy, J. L., & Robins, R. W. (2006). Appraisal antecedents of shame and guilt: support for a theoretical model. *Personality & Social Psychology Bulletin*, *32*(10), 1339–1351.

Treisman, A. M., & Gelade, G. (1980). A feature-integration theory of attention. *Cognitive Psychology*, *12*(1), 97–136.

Tversky, A., & Kahneman, D. (1974). Judgment under uncertainty: Heuristics and biases. *Science*, *185*(4157), 1124–1131.

Unsworth, N., Miller, J. D., Lakey, C. E., Young, D. L., Meeks, J. T., Campbell, W. K., & Goodie, A. S. (2009). Exploring the Relations Among Executive Functions, Fluid Intelligence, and Personality. *Journal of Individual Differences*, *30*(4), 194–200.

Van der Meer, L., Groenewold, N. a, Nolen, W. a, Pijnenborg, M., & Aleman, A. (2011). Inhibit yourself and understand the other: neural basis of distinct processes underlying Theory of Mind. *NeuroImage*, *56*(4), 2364–74.

Van der Wel, R. P. R. D., Sebanz, N., Knoblich, G., & Wel, R. P. R. D. Van Der. (2014). Do people automatically track others' beliefs? Evidence from a continuous measure. *Cognition*, *130*(1), 128–133.

Van Overwalle, F. (2009). Social cognition and the brain: a meta-analysis. *Human Brain Mapping*, *30*(3), 829–58.

Van Zoest, W., Donk, M., & Theeuwes, J. (2004). The role of stimulus-driven and goal-driven control in saccadic visual selection. *Journal of Experimental Psychology: Human Perception and Performance*, *30*(4), 746.

Vescio, T. K., Sechrist, G. B., & Paolucci, M. P. (2003). Perspective taking and prejudice reduction: The mediational role of empathy arousal and situational attributions. *European Journal of Social Psychology*, *33*(4), 455–472.

Vonk, J., Zeigler-hill, V., Mayhew, P., & Mercer, S. (2013). Mirror, mirror on the wall, which form of narcissist knows self and others best of all? *Personality and Individual Differences*, *54*(3), 396–401.

Wager, T. D., Jonides, J., & Reading, S. (2004). Neuroimaging studies of shifting attention: a meta-analysis. *NeuroImage*, *22*(4), 1679–93.

Wai, M., & Tiliopoulos, N. (2012). The affective and cognitive empathic nature of the dark triad of personality. *Personality and Individual Differences*, *52*(7), 794–799.

Wallbot, H. G., & Scherer, K. (1986). How universal and specific is emotional experience? Evidence from 27 countries on five continents. *Social Science Information*, *25*, 763–795.

Wang, C. S., Kenneth, T., Ku, G., & Galinsky, A. D. (2014). Perspective-Taking Increases Willingness to Engage in Intergroup Contact. *PloS One*, *9*(1), e85681.

Wang, Y., Chen, S., Zhu, C., & Wang, K. (2008). Theory of mind disability in major depression with or without psychotic symptoms: a componential view. *Psychiatry Research*, *161*(2), 153–161.

Wardlow, L. (2013). Individual differences in speakers' perspective taking: the roles of executive control and working memory. *Psychonomic Bulletin & Review*, *20*(4), 766–72.

Wastell, C. A., & Taylor, A. J. (2002). Alexithymic mentalising: theory of mind and social adaptation. *Social Behavior and Personality: An International Journal*, *30*(2), 141–148.

Watson, D., & Clark, L. A. (1988). Development and Validation of Brief Measures of Positive and Negative Affect : The PANAS Scales. *Journal of Personality and Social Psychology*, *54*(6), 1063–1070.

Watson, P. J., & Biderman, M. D. (1994). Narcissistic traits scale: Validity evidence and sex differences in narcissism. *Personality and Individual Differences*, *16*(3), 501–504.

Watson, P. J., Biderman, M. D., & Sawrie, S. M. (1994). Empathy, sex role orientation, and narcissism. *Sex Roles*, *30*(9-10), 701–723.

Watson, P. J., Grisham, S. O., Trotter, M. V, & Biderman, M. D. (1984). Narcissism and empathy: Validity evidence for the Narcissistic Personality Inventory. *Journal of Personality Assessment*, *48*(3), 301–305.

Watson, P. J., Hickman, S. E., & Morris, R. J. (1996). Self-reported narcissism and shame: Testing the defensive self-esteem and continuum hypotheses. *Personality and Individual Differences*, *21*(2), 253–259.

Watson, P. J., Little, T., Sawrie, S. M., & Biderman, M. D. (1992). Measures of the narcissistic personality: Complexity of relationships with self-esteem and empathy. *Journal of Personality Disorders*, *6*(4), 434–449.

Watson, P. J., & Morris, R. J. (1991). Narcissism, empathy and social desirability. *Personality and Individual Differences*, *12*(6), 575–579.

Wellman, H. M., Cross, D., & Watson, J. (2001). Meta-analysis of theory-of-mind development: the truth about false belief. *Child Development*, *72*(3), 655–84.

Westen, D. (1990). The Relations Among Narcissism, Egocentrism, Self-Concept, and Self-Esteem: Experimental, Clinical, and Theoretical Consideratio. *Psychoanalysis and Contemporary Thought*, *13*(2), 183–239.

Wicker, F. W., Payne, G. C., & Morgan, R. D. (1983). Participant descriptions of guilt and shame. *Motivation and Emotion*, *7*(1), 25–39.

Wimmer, H., & Perner, J. (1983). Beliefs about beliefs: Representation and constraining function of wrong beliefs in young children’s understanding of deception. *Cognition*, *13*(1), 103–128.

Wolkenstein, L., Schönenberg, M., Schirm, E., & Hautzinger, M. (2011). I can see what you feel, but I can’t deal with it: Impaired theory of mind in depression. *Journal of Affective Disorders*, *132*(1-2), 104–11.

Woodward, T. S., Metzak, P. D., Meier, B., & Holroyd, C. B. (2008). Anterior cingulate cortex signals the requirement to break inertia when switching tasks: A study of the bivalency effect. *Neuroimage*, *40*(3), 1311–1318.

Wright, F., O’Leary, J., & Balkin, J. (1989). Shame, guilt, narcissism, and depression: Correlates and sex differences. *Psychoanalytic Psychology*, *6*(2), 217.

Wu, S., & Keysar, B. (2007a). The effect of culture on perspective taking. *Psychological Science*, *18*(7), 600–606.

Wu, S., & Keysar, B. (2007b). The effect of information overlap on communication effectiveness. *Cognitive Science*, *31*(1), 169–181.

Xu, B., Tanaka, J., & Mineault, K. (2012). The head turn cueing effect is sustained at longer SOA’s in the presence of an object distractor. *Journal of Vision*, *12*(9), 396.

Yang, M.-L., Yang, C., & Chiou, W.-B. (2010). When Guilt Leads to Other Orientation and Shame Leads to Egocentric Self-Focus: Effects of Differential Priming of Negative Affects on Perspective Taking. *Social Behavior and Personality: An International Journal*, *38*(5), 605–614.

Youngstrom, E. a., & Green, K. W. (2003). Reliability Generalization Of Self-Report Of Emotions When Using The Differential Emotions Scale. *Educational and Psychological Measurement, 63*(2), 279–295.

Zaiser, E., & Giner-Sorolla, R. (2013). Saying sorry: shifting obligation after conciliatory acts satisfies perpetrator group members. *Journal of Personality and Social Psychology*, *105*(4), 585–604.

Zwickel, J. (2009). Agency attribution and visuospatial perspective taking. *Psychonomic Bulletin & Review*, *16*(6), 1089–93.

Appendix A: What does reflect the high difficulties to judge from one perspective over another?

So far we have underspecified the cognitive processes underlying individuals' relative ease in taking one perspective over another. Technically, this measure reflects the difference of performance between judging the number of discs (0 to 3) visible in a scene from the participant's perspective (i.e., in the whole scene) or from the perspective of a social agent (an actor or an avatar) presented sideways in the middle of the scene (i.e. in a fraction of the scene; see Figure 2). However, it is unclear whether the performance difference reflects facilitation for taking one perspective or a difficulty for taking the other. In addition, this difference was calculated by merging trials with conflicting and non-conflicting perspectives. Thus, what leads some individuals to be better at judging from one perspective over another deserves some explanations.

We propose that the relative ease in taking another person's perspective over our egocentric perspective (or inversely) is essentially driven by how attention is deployed on the visual scene between the social agent and the discs to count. However, given that the same visual scene is repeated across trials, to what extent this attentional deployment is guided by bottom-up or top-down salience of the social agent and the discs is still unclear. However, there is little doubt that participants anticipatively deploy their top-down attention based on which perspective they are prompted to take and where they expect the social agent and the discs to appear.

When they are prompted to take their egocentric perspective, they should spread their attention to include the two peripheral locations where the discs can appear. Thus, when the visual scene appears they should immediately compute the overall number of discs present in the scene. However, depending on the top-down and/or bottom-up attentional salience of the social agent, the computation of the discs can be interfered by the competing computation of the social agent and what the agent is looking at. Furthermore, if the perspectives are conflicting (i.e., inconsistent condition), this interference can be even higher because the computation of the social agent subsequently orients attention towards where he is looking at, which then leads to the computation of the looked at discs and yield an altercentric discs count that conflicts with the egocentric discs count. These interferences are called *altercentric* interferences. Thus, the magnitude of the altercentric interferences is highly dependent on the amount of attention allocated to the social agent. In support for this hypothesis, we found in Chapter 2 that forcing participants to deploy their attention to the location of the model by super-imposing task instructions on it strongly increased the extent of this interference.

Conversely, when prompted to take the other person's perspective, participants should centre and focus their attention on the middle of the screen, where the model will appear. If the extent of attention anticipatively deployed on the social agent and the attentional salience of the social agent are too low, the attentional orienting towards where the model is looking at might not be so beneficial to the processing of the looked at discs. Furthermore, if the perspectives are conflicting (i.e., inconsistent condition), the occurrence of irrelevant discs at the opposite location of where the social agent looks at might interfere with the computation of the social agent and the discs he looks at. Critically, if the looked at discs count is not enough prioritized, a conflicting and competing discs count corresponding to what is seen from our egocentric perspective is likely to strongly interfere with participants' performances. These interferences are *egocentric* interferences.

It is noteworthy that the ability to handle interferences is involved in measuring the relative ease in taking one perspective over another, which are supposed to be independent dimensions. However, given that the executive functions are identically needed to handle egocentric and altercentric interferences (Qureshi et al., 2010), the only factor leading to a higher difficulty to suppress interferences from one perspective over another is how attention is deployed between what is seen from our egocentric perspective and what is seen from the other person's perspective.

In sum, the higher difficulties in judging from one perspective over another reflect how someone deploys his attention between what is seen from his egocentric perspective and what is seen from the other person's perspective. In other words, it reflects the relative salience of information pertaining to the egocentric perspective versus another person's perspective, or how self-centred or other-centred individuals are.

Appendix B: Effects of sadness and happiness on visual perspective taking and gaze cueing

Henryk Bukowski, Maxime Résibois, Emmanuelle Rochard, Dana Samson
Institut de recherche en sciences psychologiques, Université catholique de Louvain, Louvain-La-Neuve, Belgium

1. Experiment 1

This experiment was aimed to test the impact of sadness and happiness on PT performance. Before completing either a visual perspective-taking (VPT) task or a False Belief (FB) task, participants watched a video clips inducing a sad, happy, or neutral mood. Then, after completion of either the VPT or FB task, participants recalled a personal event congruent with the emotional tone of the video clip and completed the other PT task. Before the end of the experiment, participants completed an exit questionnaire assessing how they after watching the video clip and recall the personal event.

1.1 Method

1.1.1 Participants.

Sixty-two healthy individuals were randomly assigned to one of the three mood induction conditions, with 19 participants in the sadness condition (13 females), 21 participants in the neutral condition (13 females) and 22 participants in the happiness condition (16 females; mean age: 20.42, age range: 19-27). Participants participated in return of course credits. The study was approved by the ethics committee of the Psychological Sciences Research Institute of the Université catholique de Louvain.

1.1.2 Material and procedure.

After having signed the consent forms, participants were allocated to one of the 3 mood conditions (sadness vs. happiness vs. neutral) and one of the two order conditions (VPT-then-FB vs. FB-then-VPT) in a counter-balanced order. Those in the VPT-then-FB condition, read the instructions of the VPT task, watched a video clip completed the VPT task, recalled a personal event congruent with emotional tone of the video clip, completed the FB task, and then completed an exit questionnaire assessing how they felt after each emotion induction. Those in the FB-then-VPT condition completed the FB task after watching the video clip the FB task, read the instructions of the VPT task, recalled a personal event, completed the VPT task and the exit questionnaire.

Emotional induction.

Participants were invited to watch video clips of 2 m and 43 s. In the sadness and happiness conditions, the video clip was a succession of less than 3 s video extracts in which all characters expressed the same targeted emotion and on which a musical background of the targeted emotional tone was added (Sadness: “Never meant to Belong” by Shirō Sagisu, 2005; happiness: instrumental version of “Toss the feathers” by the Corrs, 1995). The video extracts came from unpopular video clips found on internet that contained people expressing sadness or happiness. The video extracts were arranged in ascending order of emotional intensity (e.g., from lamenting sighs to mourning cries). We used these two video clips instead of movie extracts to reduce to minimum the potential biases caused by the familiarity each participant could have with the video clips and the semantic context (i.e., the specific story and values conveyed) proper to each movie extracts. In the neutral condition, we used a video clip from the database of Gross and Levenson (1995) that shows a prototypical computer screensaver with coloured polygons moving slowly and without sound. We conducted a pre-test study on sixty-three participants to assess the induction efficacy of the video clips and found that these video clips induced successfully and specifically the targeted discrete emotions.

Visual perspective-taking task.

In VPT the task (adapted from Samson et al., 2010), participants saw pictures of a human avatar positioned in the centre of a room with red discs displayed on one or two of the side walls. The avatar was seen sideways facing either the left or the right wall. The principle of the task was to judge whether a prompted number (ranging from 0 to 3) matched the number of discs visible from the prompted perspective, which could be either the participant’s perspective (self-perspective condition) or the avatar’s perspective (other-perspective condition). The number of discs visible in the room could be the same for both perspectives (consistent perspectives condition) or different (inconsistent perspectives condition). The prompted number could match or mismatch the number of discs visible in the room from the prompted perspective. The task included a total of 130 trials, evenly spread across 4 experimental conditions (2 (Perspective: self- vs. other-perspective) x 2 (Consistency: consistent vs. inconsistent perspectives)) and divided into 2 blocks of 52 trials plus a set of 26 practice trials. Like in the original study by Samson and colleagues (2010) we included 10 filler trials to avoid anticipatory responses (see the original study for details). In addition, because mismatching trials in the consistent condition always displayed number prompts irrelevant to any perspective and thus were particularly easy to process, mismatching trials were unbalanced in terms of performance difficulty with matching trials and were thus not analysed. Trials within each block were presented in a randomized order. The task lasted around 12 minutes. The task ran on E-prime (Psychology Software Tools, Pittsburgh, PA, USA), with the exact same timing of events as in the original study by Samson and colleagues (2010; see Figure 1).

False Belief task.

In the FB task (adapted from Birch & Bloom, 2007 (Birch & Bloom, 2007; Converse et al., 2008), participants read a short story about a character called Vicky who placed an violin in a blue box out of 4 possible boxes, left the room, and then came back to reach for her violin. Participants read that one of two possible events happened in the room while Vicky was absent: In the true belief (TB) condition, another character, her sister Denise, came in the room and changed the position of the 4 boxes but did not move the violin from the blue box. In the FB condition, the Denise changed the position of the boxes AND moved the violin from the blue box to the red box. Participants were instructed to judge the likelihood (in percentages) Vicky would reach for his violin for each of the 4 possible boxes after she re-entered the room. Correct PT performance in both the TB and FB condition requires the participants to judge most likely that Vicky will look for her violin in the blue box. However, in the FB condition, if participants fail to inhibit their privileged knowledge of where the violin really is, they should judge likely that Vicky will go to the red box. In this study, instead of using the FB and TB conditions as a between-subject variable as it was used in the original paradigm, participants completed both conditions subsequently in a counter-balanced order. However, in the second condition, the reference to Vicky was replaced by Andrew who was present as his brother.

Exit questionnaire.

In order to insure that the emotion inductions were successful, the participants completed at the end of the experiment a questionnaire asking about how they felt after watching the video clip and after recalling the personal event. The participants rated to what extent they felt a series of (1) 12 emotions (items adapted from Wallbot & Scherer, 1986), (2) 13 body sensations (items adapted from Izard, Libero, Putnam, & Haynes, 1993) and (3) 11 action tendencies (items adapted from Youngstrom & Green, 2003). All ratings were made on a 7-point intensity scale where 0 meant "Not at all" and 6 meant "Strongly".

2. Experiment 2

2.1 Method

2.1.1 Participants.

Ninety-one healthy individuals were randomly assigned to one of the three conditions with 30 participants in the sadness condition (25 females), 30 participants in the neutral condition (26 females) and 30 participants in the happiness condition (28 females; mean age: 21.28, age range: 19-33). Participants participated in return of credits course. The study was approved by the ethics committee of the Psychological Sciences Research Institute of the Université catholique de Louvain.

2.1.2 Material and procedure.

The procedure was similar to the one presented for Experiment 1 except that the FB task was replaced by a gaze cueing task, 3 questionnaires were completed at the beginning of the experiment, and the training session for both the VPT and gaze cueing tasks were completed before the emotion induction. After having signed the consent forms, participants completed the following questionnaires: the Interpersonal Reactivity Index (IRI; Davis, 1980), the Positive And Negative Affect Scale (PANAS; D. Watson & Clark, 1988) and the Beck Depression Inventory (BDI; Beck et al., 1960).

Questionnaires prior emotional induction.

The PANAS is a self-report questionnaire using a 5-point intensity scale ranging from "Not at all or very slightly" to "Strongly" on 10 positively and 10 negatively valenced emotional states (D. Watson & Clark, 1988). The initial emotional state of participants was assessed since it has been shown to influence perspective taking (Converse et al., 2008; Singer et al., 2006; Yang et al., 2010).

Empathy and perspective taking were assessed with the IRI (Davis, 1983), a self-report questionnaire composed of 28 statements about their personal experiences and habits in social and emotional situations on which participants had to rate their extent of agreement on a 5-point Likert scale ranging from "Strongly disagree" to "Strongly agree". The IRI is divided in 4 subscales: perspective taking, fantasy (i.e. self-absorption in fictions), empathic concern, and personal distress.

The BDI (Beck, 1961) is a self-report questionnaire containing 21 series of 4 statements among which participants must choose the one corresponding to the participant's state in the past few weeks. Depression was assessed because a few studies have reported impaired empathy and perspective taking among clinically depressed individuals (Kerr, 2003; Lee et al., 2005; Y. Wang et al., 2008; Wolkenstein et al., 2011).

Visual perspective-taking task.

Identical to Experiment 1.

Gaze cuing task.

Participants saw first a fixation cross display for 750 ms followed by a 500 ms blank delay. They then saw a picture of an avatar positioned in the centre of a blue room facing either the left or the right wall (see Figure 1). One or two red discs were displayed on the left or the right. Participants were instructed to press within 2 s on the key "1" or "2" when respectively 1 or 2 red discs appeared on the screen. Directly following the participant's response, a feedback "Correct", "Incorrect", or "No response" was presented for 1 s. "No response" feedback were presented after 2 s had elapsed without response from the participant.

In half of the trials, the avatar faced the location of the red disc(s) (consistent orientation condition) whereas the avatar faced the opposite wall the other half of the trials (inconsistent orientation condition). As in the VPT task, the interference due to the conflicting orientation of the avatar is measured by subtracting performances between the inconsistent and consistent orientation conditions. However, while a significant consistency effect is found in the VPT task when presenting the red discs simultaneously with the avatar, a small delay is usually presented in the classic gaze cueing paradigm (optimally 300 ms; Frischen et al., 2006) to find a significant consistency effect. For this reason, we introduced a delay (also referred as Stimulus Onset Asynchrony (SOA)) of 300 ms in half of the trials (SOA 300 ms condition) whereas the discs and the avatar were simultaneously presented in the other half (SOA 0 ms condition). There were 48 trials in each of the 4 (2 x (Consistency: consistent vs. inconsistent orientation) x (SOA: 0 vs. 300 ms)) experimental conditions. The task lasted approximately 12 minutes and contained 2 breaks.

Exit questionnaire.

Identical to Experiment 1.