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Isabelle Blanchette

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**Twenty years later, the cognitive portrait of openness to reconciliation in Rwanda**

Serge Caparos<sup>1</sup>, Sara-Valérie Giroux<sup>2</sup>, Eugène Rutembesa<sup>3</sup>, Emmanuel Habimana<sup>2</sup>, Isabelle

Blanchette<sup>2</sup>

<sup>1</sup> Université de Nîmes

<sup>2</sup> Université du Québec à Trois-Rivières

<sup>3</sup> University of Rwanda

**Author Note**

Serge Caparos, Département de Psychologie, EA 7352 Chrome, Université du Nîmes. Isabelle Blanchette, Sara-Valérie Giroux, and Emmanuel Habimana, Département de Psychologie, Université du Québec à Trois-Rivières. Eugène Rutembesa, College of Medicine and Health Sciences, University of Rwanda.

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### **Abstract**

With this work, we intended to draw a cognitive portrait of openness to reconciliation. No study had yet examined the potential contribution of high-level cognitive functioning, in addition to psychological health, to explaining attitudes towards reconciliation in societies exposed to major trauma such as post-genocide Rwanda. We measured the contribution of general cognitive capacity, analytical thinking, and subjective judgements. Our results show that, while higher cognitive capacity is not associated with greater openness to reconciliation, proneness to think analytically about the genocide is. The latter effect is associated with more tempered judgements about retrospective facts (e.g., number of genocide perpetrators) and prospective events (e.g., risk of genocide reoccurrence). This work establishes the importance of cognitive functioning in the aftermath of political violence: a better understanding of the influence of information processing on openness to reconciliation may help improve reconciliation policies and contribute to reducing risks of conflict reoccurrence.

**Key words:** Reconciliation; Attitudes; Analytical thinking; Judgement; Trauma

As of 2017, the number of wars and on-going political and religious conflicts is dramatically high around the world (e.g., at the time of writing, tensions are high in Burundi, Central African Republic, The Democratic Republic of Congo, Iraq, Libya, Mali, Nigeria, Sudan, Syria, Chad, Thailand, and Ukraine, among other places). These conflicts often involve massive violence resulting in thousands of deaths, including extremely high rates of civilian casualties (Lane, 2010). A particularly dramatic example of recent conflict is the 1994 Rwandan political chaos leading to the genocide of the Tutsi. This was the second worst genocide since World War II<sup>1</sup>, with an estimated 800 000 deaths in three months (approximately 10% of the population at the time).

In countries having experienced major political violence such as Rwanda, the process of reconciliation is the cornerstone of building stable durable peace (Bar-Tal, 2009; Staub, 2006). In Kinyarwanda, the language of Rwanda, the word for reconciliation “kwiwunga” comes from the same root as “setting bones together”, which highlights the necessity to put back together broken parts (King, 2013). Recent theoretical frameworks (Bar-Tal, 2009; Bar-Tal & Cehajic-Clancy, 2014; Staub, 1998) propose that reconciliation is a process of socio-psychological change through which relations between past rivals are restructured and a new psychological repertoire is built.

The establishing of such new psychological repertoire may be instigated or encouraged by governments and other social structures, but for it to be successful, a majority of individuals in the society must engage into it (Nadler & Shnabel, 2008). The probability that people embrace reconciliation is likely to vary across individuals and to be determined by a number of factors. These factors may be contextual and social (e.g., socio-economic situation; integration into the community), psychopathological (e.g., level of posttraumatic stress and depression symptoms), and cognitive (e.g., thinking style and subjective judgements). To our knowledge, other than psychopathological factors (e.g., Bayer, Klasen, & Adam, 2007; Brounéus, 2010; Pham, Vinck, Kinkodi, & Weinstein, 2010; Pham, Weinstein, & Longman, 2004), the psychological determinants of openness to reconciliation have been little explored in post-conflict societies.

In this study, we were interested in the roles of high-level cognitive processes in determining openness to reconciliation in Rwanda. We explored the role of analytical thinking, judgement, and general cognitive capacity. First, we provide the rationale for the importance of these determinants, then we present other relevant prior work that has established a link between psychological health and openness to reconciliation.

### **Analytical thinking**

If individuals are able to inhibit stereotypical prior-held beliefs and base their reflections on novel facts or objective information, this may facilitate the process of creating the new psychological repertoire necessary for reconciliation (Bar-Tal, 2009; Bar-Tal & Cehajic-Clancy, 2014; Zorbas, 2009). By contrast, if individuals tend to reflect based on stereotypes and habitual, intuitive knowledge, this may render the process of psychological restructuring involved in

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<sup>1</sup>The genocide lead by the Khmer Rouge in Cambodia (1975-1979) is considered the worst genocide since World War II, leading to an estimated 1.5 to 3 million death.

reconciliation more difficult, because individuals will rely on oriented representations of events and outgroup members (Balvin & Kashima, 2012). This idea is consistent with recent research, which has shown that the way people think and reflect about abstract information is crucial in shaping and changing their moral values and beliefs (Gawronski & Bodenhausen, 2006; Pennycook, Cheyne, Barr, Koehler & Fugelsang, 2014; Petty & Cacioppo, 2012).

The influence on thinking of stereotypes and prior-held beliefs maps onto an important distinction, well established in the study of reasoning, which suggests that thinking involves two routes that take place in parallel (Kahneman, 2003, 2011; Stanovich, Toplak, & West, 2008; Wason & Evans, 1975): Habitual ways of thinking rely on the heuristic route, also known as System 1, while explicitly or intentionally changing representations typically requires the involvement of the analytical route, also known as System 2 (Kahneman, 2011). Compared to the analytical route, the heuristic route is fast and requires few resources, but it is more heavily influenced by prior-held beliefs and anecdotal information. It is thus less likely to generate accurate deductions when reasoning about logical structures (Evans, 2003) and to produce accurate estimates when reasoning about probabilities (Kahneman, 2003).

Given the prejudices still existing in Rwanda two decades after the genocide (Arnold, 2011), we hypothesized that participants who are better able to engage into analytical thinking (i.e., use System 2), while inhibiting prior-held beliefs and stereotypes (i.e., inhibit System 1), would display more positive attitudes towards reconciliation, because they will be better able to create the new psychological repertoire necessary for reconciliation. We examined analytical vs stereotypical thinking through two angles: deductive reasoning (i.e., evaluating the logical validity of statements while ignoring prior-held beliefs) and probabilistic reasoning (i.e., making likelihood estimates based on contradictory statistical and anecdotal/stereotypical information). We postulated that the link between analytical thinking and openness to reconciliation may manifest itself more markedly when the object of reflection is related to the genocide.

### **Judgement**

One potential mechanism through which engaging in analytical thinking (rather than stereotypical thinking) may influence openness to reconciliation is through an effect on judgement. Findings have shown that individuals who are less susceptible to engage into analytical reasoning are more prone to extreme judgements and beliefs (e.g., in the realm of political ideology, moral values, or religion; Pennycook, Fugelsang, & Koehler, 2015). It is possible that Rwandans who reflect less analytically are prone to making more extreme estimates about what happened in the past and what could happen in the future. Because the genocide is a negative topic in nature, this would translate into more negative/pessimistic estimates about genocide-related issues, and by repercussion lower openness to reconciliation.

Prior findings reported in the literature are consistent with this prediction. One study conducted in Rwanda showed that the evaluation of future risks was linked to an important dimension of reconciliation, namely, coexistence; eight years after the genocide (i.e., in 2002), individuals who judged the safety level in Rwanda more negatively were less open to coexistence

between victims and non-victims than individuals who judged levels of safety less negatively (Pham et al., 2004).

Judgements about past events and future risks may be seen as core elements of the retrospective and prospective dimensions of psycho-social restructuring proposed by Bar-Tal & Cehajic-Clancy (2014; Bar-Tal, 2009) in their model of reconciliation. In this study, we evaluated participants' estimates of past facts related to the genocide (e.g., estimated number of individuals who perpetrated the genocide) and future possibilities (e.g., estimated risk of genocide reoccurrence). We tested whether more tempered estimates predicted higher openness to reconciliation, and whether the effect of analytical thinking (presented above) was mediated by this effect of judgement.

### **General cognitive capacity**

Previous research has shown that high-level cognitive processes such as reasoning rely heavily on the availability of cognitive resources (e.g., Evans, 2008; Pennycook et al., 2014): participants with higher fluid intelligence or working-memory capacity are better able to engage in analytical thinking. Thus, in order to be able to distinguish specific effects of analytical thinking from generic effects of cognitive capacity (Pennycook et al., 2015), we also examined the latter factor in this study.

Another motivation for measuring cognitive capacity was that previous findings have shown a positive relationship between forgiveness and executive functions, which are highly correlated to cognitive capacity (Barkley, 1997; Friedman et al., 2006, 2007; Pronk et al., 2010). For instance, Pronk et al. (2010) showed that a victim's ability to forgive and to maintain or restore a relationship with an offender not only relies on the victim's motivation but also strongly depends on the victim's performance in the two-back task (i.e., a working memory task), and this is especially true for severe offenses. According to the authors, higher working-memory capacity increases individuals' aptitude to regulate their behaviours, thoughts and feelings related to an offense, through a more efficient selection of relevant information against irrelevant information (Hofmann, Gschwendner, Frieze, Wiers, & Schmitt, 2008). Given that forgiveness is an important dimension of openness to reconciliation (Zorbas, 2009), it is possible that general cognitive capacity is linked to attitudes towards reconciliation.

In this study, we also examined the effect of level of education, due to a large literature showing that more educated individuals have higher abstract-thinking abilities, executive functions and working memory capacity, independently of other demographic and socio-economic variables (e.g., Fry & Hale, 1996; Lee, Lu, Ko, 2007; Le Carret et al., 2003; Van Hooren et al., 2007). We expected education and general cognitive capacity to be positive predictors of openness to reconciliation.

### **Psychological health**

In a post-conflict context, it is vital to address the contribution of psychological health. Trauma exposure is linked to poorer psychological health, and this has been shown to be an important obstacle against reconciliation (Bayer et al., 2007; Pham et al., 2004, 2010). For

instance, in post-genocide Rwanda and in conflict-ridden Democratic Republic of the Congo (DRC), stronger PTSD and depression symptoms are associated with a stronger feeling of vengeance and lower openness to reconciliation (Pham et al., 2004, 2010). Conceptually similar effects have been observed in Israel in one study where higher levels of PTSD symptoms were related to increased support for political violence and more negative attitudes towards the outgroup (Johnson et al., 2009). Such negative outcome is consistent with findings of a loss of trust in others (Cias, Young, & Barreira, 2000) and stronger feelings of anger (Kunst, Winkel, Bogaerts, 2011) in western PTSD victims, compared to non-PTSD victims. In line with previous findings, we expected to observe a negative relationship between PTSD symptoms and openness to reconciliation.

### **Openness to reconciliation**

Zorbas (2009) has shown that the psychological repertoire which promotes reconciliation in Rwanda includes several dimensions, notably (1) forgiveness, (2) the restoration of the feeling of security and trust, (3) the recognition that truth has been told and justice has been achieved, and (4) the belief that former rivals can cordially coexist.

*Forgiveness.* Forgiveness mitigates the moral inferiority generated by the role of perpetrators (Exline & Baumeister, 2000) and allows perpetrators to be reintegrated to the moral community to which their membership was questioned (Hewstone et al., 2008; Noor, Brown, Gonzalez, Manzi, & Lewis, 2008).

*Trust.* After a genocide, other people (especially members of outgroups) may appear untrustworthy (Staub, 1998). Lack of trust is a symptom of ongoing conflict and lack of security (Paluck, 2009). An inability to trust others, especially ones' family, friends or neighbours, will impinge any reconciliation process (Hewstone et al., 2008; McCann & Pearlman, 1990). In Rwanda, trust is a particularly important factor to consider (Zorbas, 2009) given that the genocide was promoted by the government of the time and perpetrated mostly by people known to the victims (people from the neighbourhood, and sometimes family and friends).

*Truth and justice.* The justice process may lead to a symbolic erasure of the roles of victim and perpetrator, and this places the two parties on more equal footing (North, 1998) and leads to greater willingness to reconcile (Mukashema, & Mullet, 2010; Nadler & Shnabel, 2008; Worthington, 2006). In Rwanda, a justice process took place on a large scale under a transitional justice scheme, the Gacaca courts, which occurred between 2002 and 2012 and where tens of thousands of genocide perpetrators were judged.

*Coexistence.* Coexistence is the capacity for former rivals to live side by side (Shnabel & Nadler, 2008; Zorbas, 2009) and to resume the capability to cooperate and have social interactions, to hear each other, and to live and work together on a daily basis.

In the present study, we created a questionnaire which evaluated participants' endorsement of the above four dimensions of reconciliation.

To our knowledge, no study has yet attempted to draw a psychological portrait of openness to reconciliation which includes both affective and cognitive factors. In this study, we measured the links between psychological health, cognition, socio-demographics, and openness to reconciliation. The link between the different variables and openness to reconciliation was tested using bivariate correlations and hierarchical regressions. Four main hypotheses were examined:

Hypothesis 1: Participants less able to engage in analytical thinking and to inhibit prior-held beliefs and stereotypes will be less open to reconciliation. This effect will manifest itself more markedly when the object of reflection is related to the genocide.

Hypothesis 2: Participants making more extreme/negative judgements about genocide-related issues will be less open to reconciliation. The effect of analytical thinking (Hypothesis 1) will be mediated by this effect of judgement.

Hypothesis 3: Lower general cognitive capacity and lower education will be linked to lower openness to reconciliation.

## **Method**

### **Participants**

Three hundred and forty nine Rwandan participated in this study (173 females, mean age 36.8 years, SD = 7.6, age range 27-64 years). Participants were recruited through our research assistants and word of mouth, in Kigali (capital city of Rwanda) and the Rwandan districts of Kibuye, Gizenyi, Nyabihu, Nyanza, Mututu, and Kibirizi. Data collection took place during four three-week visits to Rwanda, in January 2014, August 2014, February 2015 and August 2015. During each visit, we recruited as many participants as possible. There were three inclusion criteria: (1) being at least 30 years of age, (2) being able to speak and read Kinyarwanda, and (3) having been present in Rwanda at the time of the genocide. Our inclusion criteria meant that only participants who were at least ten years old at the time of the genocide<sup>2</sup> and who were literate could participate. The latter limitation was made necessary by material constraints, which did not allow us to perform questionnaires and cognitive tasks orally. Participants were compensated 7000 RWF (about 9 €) for their time.

Because the current policy in Rwanda discourages from directly asking participants their ethnic group (Tutsi or Hutu), and because group membership is a complex issue, we used an accepted indirect method to assess group identity, by asking participants if they belonged to the group which was targeted by the genocide. The sample consisted of 186 participants identifying with the group targeted by the genocide (53.3%), which we refer to as victims, and 127 participants not identifying with the targeted group (36.4%), which we refer to as non-victims. In the sample, 36 participants did not disclose the group they belonged to (10.3%).

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<sup>2</sup>Twelve participants reported being less than 30 years old (i.e., 27 to 29). They were kept in the analyses given that they would have been old enough to remember their experience of the genocide.

## The cognitive portrait of openness to reconciliation in Rwanda

The socio-demographic information concerning our sample (see Stimuli and Procedure section) is presented in Table 1. In this study, the most typical participant was between 30 and 40 years old, educated to at least the primary level, believer in God, financially modest, with few children, and well integrated within the community.

**Table 1.** Study sample broken down by the different socio-demographic variables

	N	Percentage (%)
<b>Age</b>		
27-29	12	3.5
30-39	228	66.3
40-49	76	22.1
50-59	24	7.0
60-64	4	1.2
<b>Education</b>		
Incomplete primary	36	10.7
Primary	112	33.1
Secondary	103	30.5
University	87	25.7
<b>Importance of God</b>		
None	3	0.9
Little bit important	56	16.4
Quite important	116	34.0
Very important	166	48.7
<b>Family size</b>		
1-2	110	31.9
3-4	115	33.3
5-6	78	22.7
7-8	42	12.2
<b>Wealth</b>		
Very modest	51	15.3
Modest	112	33.5
A little bit modest	60	18.0
Neither modest nor well off	96	28.7
A little bit well off	15	3.6
<b>Integration into community</b>		
Not at all integrated	12	5.4
A little bit integrated	32	14.3
Quite integrated	85	37.9
Very integrated	95	42.4

*Note: Total N differs across socio-economic variables due to missing values.*

Genocide victims were slightly over-represented compared to non-victims in our sample, and their proportion in our sample (53.5%) is larger than in the Rwandan population (about 10%). Victims reported more severe exposure to the genocide ( $M = 5.2$ ) than non-victims ( $M = 3.9$ ), and they also reported higher levels of PTSD symptoms (PCL-C score:  $M = 43.8$ ) than non-victims ( $M = 34.8$ ). Nevertheless, although non-victims were not directly targeted by the genocide, their level of genocide exposure was high and they presented substantial psychopathological symptoms. The sample was assessed as a whole and level of exposure – instead of ethnic group – was used as a predictor in this study. We report additional analyses in Supplemental Material showing that the effects of the variables tested in this study operated similarly in victims and non-victims.

### **Stimuli and procedure**

Testing sessions lasted between 2 and 3 hours and consisted of two parts: (1) filling a set of computer-presented questionnaires, and (2) completing a set of computer-based cognitive tests. During each testing session, five to seven participants were tested in parallel using five to seven different laptops. Participants completed the two parts of the experiment in a counterbalanced order. Testing instructions were always presented on screen. The first and last author of the current paper and two Rwandan research assistants (trained clinical psychologists) were present during all testing sessions in order to offer guidance, assistance and support. Research assistants' guidance helped participants who were not familiar with computers to complete the questionnaires and perform the tests autonomously.

### **Questionnaires**

The questionnaires were first written in French, based on questionnaires previously used in Rwandan studies (Arnold, 2011; Brounéus, 2010; Pham et al., 2004, 2010). The questionnaires were then translated and back translated from French to Kinyarwanda by two translators, independently of each other. Differences and errors were discussed with the lead researchers, and appropriate wording was decided on.

Questions were presented in a fixed order, which was the same for all participants. Each question was presented on the top half of the screen and a set of proposed answers was presented on the bottom half of the screen. Each proposed answer was identified by a unique digit (from 0 to 8; there were thus never more than 9 proposed answers for a given question). Participants gave their response to each question by pressing the digit key corresponding to their chosen answer (0 to 8) on the laptop keyboard. For each question, participants had the possibility not to respond by pressing the '9' key (for "(9) I prefer not to respond"). Overall, participants chose not to respond to 5.2% of the questions. For each questionnaire, a missing value was replaced by the participant's average score for that questionnaire.

**Socio-demographics.** Participants answered socio-demographic questions about (a) family size (presence of partner was scored '0' or '1', and number of children was scored from '0' to '6+'; partner and children scores were then added to obtain a family-size score which could range from '0' to '7'), (b) wealth (scored from '1', "I consider that I am very poor", to '7', "I consider that I am very wealthy"), (c) importance of God (scored from '0', "God plays no role in my daily life", to '3',

“God plays a very important role in my daily life”), (d) education (scored from ‘1’, “Primary school”, to ‘3’, “University course”), and (e) integration into local community (scored from ‘0’, “I am not at all involved in my local community – i.e., neighbours, associations, church”, to ‘3’, “I am extremely involved in my local community – i.e., neighbours, associations, church”; the latter question was added during the third data collection and was thus answered by only 224 participants).

Genocide exposure. Participants were asked whether they had been exposed to a number of potentially traumatic events linked to the genocide, namely, (1) damaged, stolen or lost belongings, (2) fleeing, (3) being seriously ill, (4) being injured, (5) having experienced sexual assault, (6) being handicapped, (7) having a close parent who was killed during the genocide, (8) having a close parent who became seriously ill because of the genocide, and (9) having a close parent who became handicapped because of the genocide. Participants answered “yes” (scored ‘1’) or “no” (scored ‘0’) to each item and obtained a genocide-exposure score that ranged from zero (no exposure to the genocide) to nine (maximal exposure to the genocide). Note that the Kinyarwanda term used in the questionnaire was ‘abavandimwe’, which literally means ‘from the same womb’. This term refers to people who are very important to an individual, either because they are close family members (e.g., siblings, parents, cousins), or because they are very close friends who are considered family.

Psychological health. Participants filled a Kinyarwanda-translated version of the Posttraumatic Stress Disorder Checklist – Civilian (PCL-C; Blanchard, Jones-Alexander, Buckley, & Forneris, 1996). This questionnaire indexed the incidence of posttraumatic stress symptoms related to the Rwandan genocide. Participants gave an answer from one (not at all) to five (extremely) to each item. Items addressed symptoms associated with the three clusters of posttraumatic stress disorder symptoms, namely, (1) intrusion (i.e., persistently remembering or reliving the genocide through intrusive flashbacks, vivid memories, and/or recurring dreams), (2) avoidance/numbing (i.e., efforts to avoid any circumstance resembling or associated with the genocide; feelings of detachment and emotional numbness), and (3) hyperarousal (difficulty in falling or staying asleep, irritability or outbursts of anger, difficulty in concentrating, hypervigilance, exaggerated startle response). This scale has good psychometric properties, it is easily administered by laypeople, it uses simple language, and it has been previously used in Rwandan samples (e.g., Pham et al., 2004).

Openness to reconciliation. Participants filled an openness to reconciliation questionnaire made of four subscales. The first subscale consisted of three statements regarding participants’ opinions about the Gacaca trials (e.g., “People feel better now thanks to the Gacaca trials”). The second subscale consisted of four statements regarding participants’ opinions about coexistence between former rivals (e.g., “In the future, for the good of our country, we need to welcome those who will come back amongst us after having served a sentence following the Gacaca trials”). The third subscale consisted of three statements about trust and security (e.g., “It is necessary to be on alert with others, even with neighbours and friends.”). Finally, the fourth subscale consisted of four statements about participants’ forgiveness disposition (e.g., “I have succeeded in forgiving

those who have hurt me.”). The questions are presented in full in Supplemental Material, both in English and Kinyarwanda. For each question, participants chose an answer from 1 to 7 for: “(1) I absolutely disagree”, “(2) I strongly disagree”, “(3) I somewhat disagree”, “(4) I neither agree nor disagree”, “(5) I somewhat agree”, “(6) I strongly agree”, or “(7) I absolutely agree”. For each participant, the 14 responses were transformed into percentages and averaged to obtain a mean ‘openness to reconciliation’ score, which ranged from “0%” (not at all open to reconciliation) to 100% (completely open to reconciliation).

### Cognitive tasks

The study presented here was part of a larger investigation looking into the effect of the Rwandan genocide on reasoning, memory and perception. Participants performed the tasks presented below along with a battery of other cognitive tests. The results of these other tests are presented in parallel publications. The cognitive factors considered in the present study were threefold: (1) analytical thinking, assessed through probabilistic and deductive reasoning tasks, (2) judgement, and (3) general cognitive capacity.

*Probabilistic reasoning.* A subset of participants (N=207)<sup>3</sup> performed a base-rate task (e.g., Eliades, Mansell, & Blanchette, 2013), which used problems made of two premises and two response choices. The first premise provided statistical information about a hypothetical subset of the Rwandan population (e.g., “Out of 1,000 Rwandans, 910 did not go to university and 90 went to university”) and the second premise provided anecdotal/stereotypical information about a fictitious character who was randomly selected from that subset (e.g., “Pacifique has a good job, he earns a good living, and he lives in a big house”). Participants were then asked to decide which of two situations was most likely to apply to the character presented in the problem (e.g., “what is most likely? (1) Pacifique went to university, or (2) Pacifique did not go to university”).

In incongruent problems (e.g., in the example provided above), statistical and stereotypical information each supported a different response. In these problems, when participants gave responses consistent with the statistical information (e.g., “Pacifique did not go to university”), this suggested that they used System 2 (i.e., they were able to inhibit their prior beliefs and they based their reasoning on objective numerical information; Stanovich et al., 2008). When participants gave responses consistent with the stereotypical information (e.g., “Pacifique went to university”), this suggested that they used System 1 (i.e., they were not able to use objective numerical information and they based their reasoning on prior stereotypical beliefs; Stanovich et al., 2008).

Problem content was manipulated; it could be neutral (e.g., in the example above) or related to the genocide (see Supplemental Material for a presentation of problems in full). For each participant and for each content (i.e., neutral and genocide-related content) of incongruent

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<sup>3</sup>Data collection on this task was originally planned for the first 2 research visits to Rwanda (January 2014 and August 2015). Due to the high number of participants making mistakes on control problems, data collection was extended to the third research visit (February 2015).

problems, we measured the frequency of statistical responses (i.e., responses consistent with the statistical information) and used that frequency as an index of analytical thinking.

In this task, a subset of four problems were used to ensure that participants understood the task. In these control problems, the two premises pointed to the same response. Statistical and stereotypical information were thus congruent and, unlike in incongruent problems, there was a correct response. Control and incongruent problems were intermixed and presented in a random order. Overall, participants had low accuracy on the control problems: half of the sample made one or more errors on these problems, out of a maximum of four errors. On the basis that the latter participants may not have understood the task, only participants who gave correct responses to all four control problems (N=97) were included in the analyses.

*Deductive reasoning.* A subset of participants (N=228)<sup>4</sup> performed a belief-bias deductive reasoning task (e.g., Eliades, Mansell, Stewart, & Blanchette, 2012). The problems used in this task were ‘Modus Ponens’ conditional syllogisms. Participants were presented with a logical rule (e.g., “If a man is hungry, then he does not eat”) and a qualifying statement (e.g., “Dieudonné is hungry”). Participants were then asked to choose which of two conclusions logically followed: one conclusion logically followed from the rule and the qualifying statement, whereas the other one did not (e.g., “What is more logical? (1) Dieudonné eats, or (2) Dieudonné does not eat”).

Participants were told to reason as if the rule was true, even when it was not true in real life. In six incongruent problems (e.g., in the example provided above), the rules were not believable in real life. In these problems, unbelievable but logical responses (e.g., “Dieudonné does not eat”) suggested that participants used System 2 (i.e., they were able to inhibit their prior beliefs and base their reasoning on the logical rule provided; Stanovich et al., 2008). On the other hand, believable but illogical responses (e.g., “Dieudonné eats”) suggested that participants used System 1 (i.e., they overlooked the logical rule and were not able to inhibit their prior beliefs).

Problem content was manipulated; it could be neutral (e.g., in the example above) or related to the genocide (see Supplemental Material for a presentation of the problems in full). For each participant and for each content (i.e., neutral and genocide-related content), we measured the frequency of logical responses in incongruent problems and used that frequency as an index of analytical thinking.

In this task, we also presented six control problems, which were used to ensure that participants understood the task. In these problems, believability and logicity were congruent (i.e., both System 1 and System 2 promoted the logical response). The control and incongruent problems were intermixed and presented in a random order. Participants’ overall accuracy on control problems was high (90%), suggesting that the task was well understood. Participants who gave correct responses to at least five (out of six) control problems were included in the analyses (N=197).

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<sup>4</sup>Data collection on this task was performed during the last two research visits (February 2015 and August 2015).

*Judgement.* Participants made retrospective and prospective estimates about genocide related issues. They estimated (1) the proportion of genocide perpetrators (“In your opinion, if we randomly draw 10 Rwandans, how many of them committed a crime during the genocide?”), (2) the proportion of criminals who were judged in the Gacaca trials (“In your opinion, if we randomly draw 10 Rwandans who committed a crime during the genocide, how many of them were tried for their crime?”), (3) the number of non-victims who protected victims (“In your opinion, if we randomly draw 10 non-victims, how many of them did not protect victims during the genocide?”), (4) the likelihood for the genocide to reoccur in the future (“In the future, there are strong chances that a genocide like the 1994 genocide reoccurs in Rwanda. What do you think about this statement?” with possible answers ranging from ‘1’, “I totally agree”, to ‘7’, “I totally disagree”), and (5) the risk for the genocide to reoccur in the future (“According to you, what is the risk that the genocide will reoccur in the future?” with possible answers ranging from ‘0’, “no risk”, to ‘4’, “very high risk”). Participants used the numerical keyboard to give their answer to each question. The fourth question was reverse coded, then responses were transformed into percentages and averaged to obtain a judgement score.

The actual proportion of genocide perpetrators can be estimated. Although a 2005 estimate puts it as low as 200 000 perpetrators (Straus, 2004), 1.2 million individuals were tried during the wide-scale transitional justice program that spanned between 2002 and 2012 (the Gacaca trials)<sup>5</sup>. These figures suggest that between 2% (low estimate) and 20% (high estimate) of the 1994 Rwandan population (i.e., around 10 million) took part in the genocide. In this study sample, only 35% of the participants estimated the percentage of perpetrators to range between 1 and 20%. 65% of the participants estimated it to range between 30% and 80%, showing a negative bias in their estimates.

Other judgements (e.g., number of untried perpetrators, number of non-victims not protecting victims, and risk of genocide reoccurrence) cannot be contrasted to any known figures. However, we interpret higher values to show a more pessimistic outlook on Rwanda’s past and future. Interestingly, genocide exposure was not related to these judgements,  $r(335) = -.02$ ,  $p = .71$ , suggesting that pessimism in these judgements does not reflect differences in genocide experiences.

*Verbal fluency.* A subset of participants ( $N=200$ )<sup>6</sup> performed a verbal fluency task (e.g., Shao, Janse, Visser, & Meyer, 2014; Unsworth, Spillers, & Brewer, 2010) to assess general cognitive capacity. Participants were asked to produce as many examples as possible of three categories: (1) first names, (2) animal names, and (3) country names. For each category, they were given one minute to produce their responses. The three categories were performed separately, in a counterbalanced order across participants. For each participant, the number of correct items

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<sup>5</sup> <http://www.un.org/en/preventgenocide/rwanda/about/bgjustice.shtml>

<sup>6</sup> Data collection on this task was performed during the last two research visits (February 2015 and August 2015).

was averaged across the three categories and used as an index of general cognitive capacity (Unsworth et al., 2010).

### **Ethics**

Conducting a study on genocide exposure and attitudes towards reconciliation in Rwanda requires fundamental ethical considerations. This study was approved by the Ethics Committee of Université du Québec à Trois-Rivières in Canada. In Rwanda, the research project was ethically and methodologically reviewed and approved by the National Ethics Committee of Rwanda, the National Unity and Reconciliation Commission, and the National Commission for the Fight against Genocide, the three authorities from which permission was required for such a study. Because of the vulnerability of the population tested in this study and the sensitivity of the topic, close discussions were held continuously during the extent of the project to minimise the risks for the participants. Procedures were put in place to manage possible negative reactions experienced by the participants. At the end of the testing session, all participants were invited to express their views on the study and questioned about their current feelings. The great majority of participants expressed extremely positive feedback about the experience.

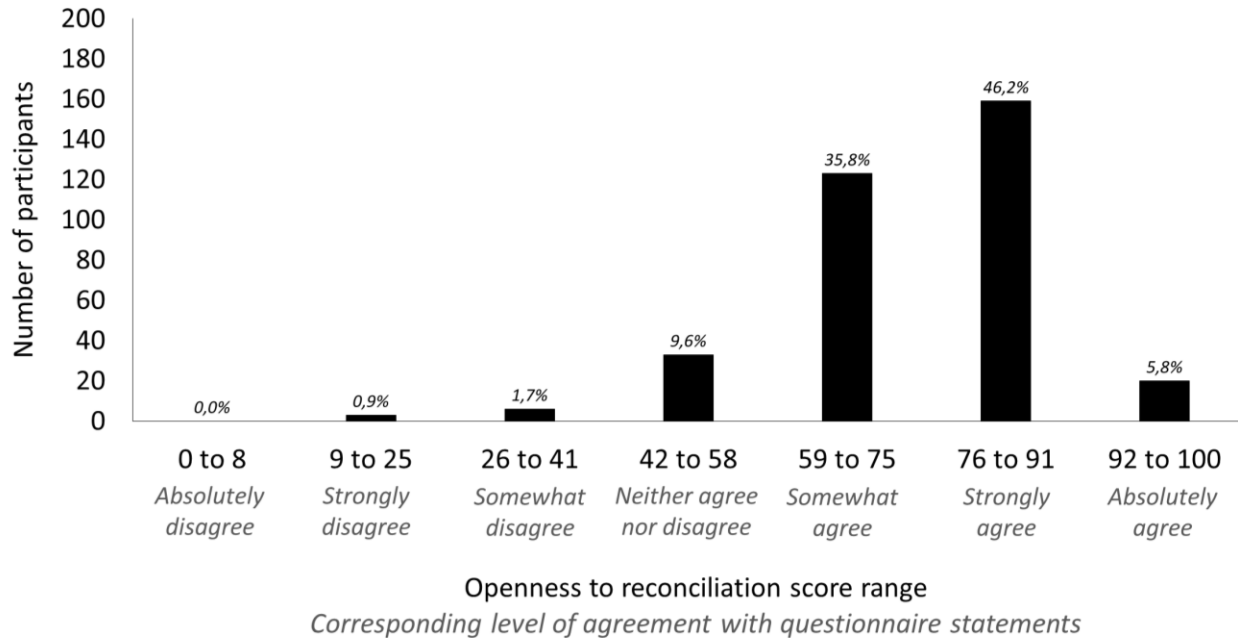
### **Results**

#### **Openness to reconciliation**

The distribution of openness to reconciliation scores is presented in Figure 1. The questionnaire had a good reliability overall (Cronbach alpha of .78; Cronbach, 1951). Inter-item correlation was at .20, CI 95% [.17, .23], which is an adequate level for a broad higher-order construct such as openness to reconciliation (Clark & Watson, 1995) and suggests that the questionnaire had a good homogeneity (Briggs & Cheek, 1986). In addition, 81% individual inter-item correlations were moderate in magnitude and clustered around the mean value, falling between .10 and .50, which is a good indicator of unidimensionality (Briggs & Cheek, 1986; Clark & Watson, 1995). Finally, an exploratory principal component analysis showed that one factor explained 29% of the variance, with all items loading on it either strongly ( $r_s > .60$ , 6 factors) or moderately ( $r_s > .30$ , 8 factors; Hair, Black, Babin, Anderson, and Tatham, 1998; Guadagnoli & Velicer, 1988; see Supplemental Material). Other factors neither explained more than 15% of the variance nor had strong loadings (all  $r_s < .60$  for other factors), suggesting that the questionnaire isolated one major dimension only (Costello & Osborne, 2005; Slocum-Gori & Zumbo, 2011).

We used the mean score of the entire questionnaire as an indicator of openness to reconciliation. Mean openness to reconciliation score was 73.6% (SEM = 0.8) suggesting that openness to reconciliation was overall quite high in the sample. On average, 88% of the participants agreed overall (somewhat, strongly, or absolutely) with the questionnaire items (see Figure 1).

## The cognitive portrait of openness to reconciliation in Rwanda



**Figure 1.** Distribution of openness to reconciliation mean scores in the sample ( $N = 344$  participants).

### Socio-demographics

We ran bivariate correlations to identify relationships between openness to reconciliation and socio-demographic variables (see Table 2). The only significant – although weak – predictor of openness to reconciliation among those variables was community integration,  $r(224) = .15$ ,  $p = .02$ , suggesting a role of the social context participants live in. As a whole, socio-demographic measures did not explain variance in openness to reconciliation scores. For this reason, they were not included in subsequent regression analyses (see below) to avoid Type 1 error due to the inclusion of an excessive number of variables.

### Cognition and psychological health

We used two hierarchical multiple regressions to test whether openness to reconciliation was predicted by analytical thinking, judgement, general cognitive capacity, education, PTSD symptoms and genocide exposure. Probabilistic and deductive reasoning were used as indicators of analytical thinking, respectively in Analysis 1 and 2 (see Tables 3 and 4; the two analyses could not be performed together because not all participants performed both tasks).

First step: Education and general cognitive capacity. In the first step of the regression analyses, we tested the effect of education and general cognitive capacity on openness to reconciliation, using level of education<sup>7</sup> in Analysis 1, and level of education and verbal fluency in

<sup>7</sup>Because half the participants entered in Analysis 1 did not perform the verbal-fluency task, we could not use verbal fluency in this analysis; however, there was a strong relationship between

Analysis 2. Reconciliation scores were negatively predicted by level of education in the first analysis,  $\beta = -.33$ , CI 95% [-.59, -.15], and by verbal fluency in the second analysis,  $\beta = -.18$ , CI 95% [-.31, -.02].<sup>8</sup>

**Table 2.** *Pearson's correlation table: socio-demographic variables and openness to reconciliation*

	Age	Family size	Wealth	Importance of God	Community integration
Openness to reconciliation	.02 (N=340)	.07 (N=343)	-.04 (N=332)	-.02 (N=339)	<b>.15*</b> (N=224)
Age	–	<b>.60***</b> (N=340)	-.04 (N=330)	.00 (N=336)	.13 <sup>†</sup> (N=221)
Family size		–	<b>-.15*</b> (N=333)	-.05 (N=339)	<b>.15*</b> (N=222)
Wealth			–	.09 (N=330)	<b>.13<sup>†</sup></b> (N=217)
Importance of God					<b>.18*</b> (N=221)

<sup>†</sup> $p < .10$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .005$ .

*Second step: Analytical thinking.* We entered the analytical thinking variables in the second step of the analyses. Frequency of statistical responses on base-rate problems (probabilistic reasoning) were entered in Analysis 1, and frequency of logical responses on belief-bias reasoning problems (deductive reasoning) were entered in Analysis 2. In order to test for content-specific effects, frequencies of statistical/logical responses were entered separately for neutral and genocide-related contents.

A significant amount of variance in openness-to-reconciliation scores was explained by analytical thinking with genocide-related problems in both analyses,  $\beta = .25$ , CI 95% [.11, .95], for the base rate task, and  $\beta = .24$ , CI 95% [.04, .37], for the deductive reasoning task. These findings suggest that participants who are better able to think analytically about genocide-related

education and verbal fluency in participants for whom both measures were available,  $r(192) = .49$ ,  $p < .001$ , suggesting that education and verbal fluency tapped into a similar latent variable (Fry & Hale, 1996; Lee, Lu, Ko, 2007; Le Carret et al., 2003; Van Hooren et al., 2007).

<sup>8</sup>Note that the effect of education did not reach significance in Analysis 2; this was due to the shared variance between education and verbal fluency. When the second analysis was performed without verbal fluency, the effect of education reached significance,  $\beta = -.18$ , CI 95% [-.30, -.04].

contents (i.e., better able to inhibit anecdotal information and prior beliefs) are more open to reconciliation. With neutral problems, neither frequency of statistical responses (Analysis 1) nor frequency of logical responses (Analysis 2) was related to reconciliation scores.

**Table 3.** Analysis 1. Hierarchical multiple regression testing whether education, probabilistic reasoning, judgement, PTSD symptoms and genocide exposure predict openness to reconciliation.

Variables	Step 1		Step 2		Step 3		Step 4	
	B (SE)	$\beta$	B (SE)	$\beta$	B (SE)	B	B (SE)	B
<b>General cognition</b>								
Education	-5.2 (1.6)	-.33***	-5.4 (1.5)	-.34***	-4.4 (1.4)	-.28***	-4.9 (1.5)	-.30***
<b>Analytical thinking:</b>								
<b>Probabilistic reasoning</b>								
Frequency of statistical responses (neutral)			5.2 (7.9)	.07	8.9 (7.3)	.13	8.3 (5.7)	.13
Frequency of statistical responses (genocide)			22.9 (10.8)	.24*	10.9 (10.1)	.11	9.4 (8.3)	.11
<b>Judgement</b>								
Genocide-related estimates					-0.3 (0.1)	-.42***	-0.3 (0.1)	-.43***
<b>Genocide impact</b>								
PTSD symptoms							-0.1 (0.1)	-.09
Genocide exposure							-1.0 (0.7)	-.13
<b><math>\Delta R^2</math> from step to step</b>	<b>.11***</b>		<b>.07*</b>		<b>.15***</b>		<b>.03</b>	
<b>Total <math>R^2</math></b>	<b>.11***</b>		<b>.18***</b>		<b>.33***</b>		<b>.36***</b>	

Note: N=93; † $p < .1$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .005$ .

**Third step: Judgement.** In the third step of the regressions, we entered genocide-related judgments both in Analyses 1 and 2. A higher value means more extreme/pessimistic estimates. Genocide-related judgements accounted for a significant amount of variance in openness-to-reconciliation scores in both analyses, respectively  $\beta = -.42$ , CI 95% [-.57, -.23] and  $\beta = -.15$ , CI 95% [-.29, -.01]; this shows that more extreme retrospective/prospective judgements about the genocide are linked to more negative attitudes towards reconciliation.

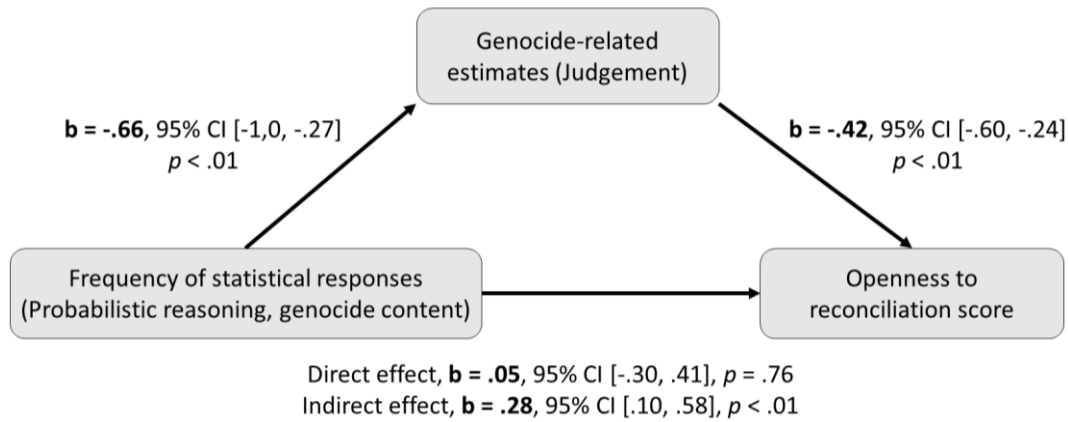
**Table 4.** Analysis 2. Hierarchical multiple regression analysis testing whether education, general cognitive capacity, deductive reasoning, judgement, PTSD symptoms and genocide exposure predict openness to reconciliation.

Variables	Step 1		Step 2		Step 3		Step 4	
	B (SE)	$\beta$	B (SE)	$\beta$	B (SE)	$\beta$	B (SE)	$\beta$
<b>General cognition</b>								
Education	-1.4 (1.1)	-.11	-1.4 (1.1)	-.11	-1.5 (1.1)	-.12	-1.7 (1.0)	-.13
Verbal fluency	-0.4 (0.2)	<b>-.18*</b>	-0.4 (0.2)	<b>-.19*</b>	-0.4 (0.2)	<b>-.17*</b>	-0.4 (0.2)	<b>-.19*</b>
<b>Analytical thinking: Deductive reasoning</b>								
Frequency of logical responses (neutral)			-5.5 (2.9)	-.19	-5.6 (2.9)	-.19	-4.0 (2.9)	-.15
Frequency of logical responses (genocide)			9.3 (3.7)	<b>.24*</b>	9.4 (3.7)	<b>.24*</b>	6.5 (3.8)	<b>.17†</b>
<b>Judgement</b>								
Genocide-related estimates					-0.1 (0.1)	<b>-.15*</b>	-0.1 (0.1)	<b>-.15*</b>
<b>Genocide impact</b>								
PTSD symptoms							-0.2 (0.1)	<b>-.22**</b>
Genocide exposure							0.3 (0.5)	.05
$\Delta R^2$ from step to step	<b>.06**</b>		<b>.04*</b>		<b>.02*</b>		<b>.04*</b>	
Total $R^2$	<b>.06**</b>		<b>.10***</b>		<b>.12***</b>		<b>.16***</b>	

Note: N=164; † $p < .1$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .005$ .

Interestingly, in the third step of Analysis 1, the effect of frequency of genocide-related statistical responses (i.e., genocide-related probabilistic reasoning) became non-significant,  $\beta = .12$ , CI 95% [-0.16, .65], suggesting the presence of shared variance between genocide-related probabilistic reasoning and genocide-related judgement. On the basis of this result, we ran a mediation analysis using the procedure described by Hayes (2012, 2013), with openness to reconciliation as the dependent variable, frequency of genocide-related statistical responses as the independent variable, and genocide-related estimates as the mediator (see Figure 2). The direct effect – between frequency of genocide-related statistical responses and openness to reconciliation – was not significant,  $b = .05$ ,  $p = .76$ , 95% CI [-0.30, .41]. On the other hand, the indirect effect – through genocide-related estimates – was significant,  $b = .28$ ,  $p < .001$ , 95% CI [.10, .58]. These results suggest that the effect of probabilistic reasoning was mediated by judgement. In Analysis 2, analytical thinking in deductive reasoning and judgement did not share

common variance, showing that the effect of deductive reasoning was not mediated by judgement.



**Figure 2.** Mediation analysis, using frequency of genocide-related statistical responses as the independent variable, genocide-related estimates as the mediator, and openness to reconciliation scores as the dependent variable.

Fourth step: Genocide exposure and PTSD symptoms. Finally, in the fourth step of the analyses, we entered genocide exposure and PTSD symptoms. While the former did not account for a significant amount of variance in openness-to-reconciliation scores (see Tables 3 and 4), the latter did but only in the second analysis,  $\beta = -.22$ , CI 95% [-.34, -.06].

## Discussion

With this work, we intended to draw a cognitive portrait of openness to reconciliation. No study had yet examined the potential contribution of high-level cognitive functioning, in addition to psychological health, to explaining attitudes towards reconciliation in societies exposed to major trauma such as post-genocide Rwanda. The role of cognition is important to consider given that trauma exposure impacts not only individuals' affective state but also their cognitive functioning (Blanchette & Caparos, 2016; El-Hage, Gaillard, Isingrini, & Belzung, 2006; Klein & Boals, 2001). Furthermore, current theories of reconciliation place cognitive processes at the heart of this psychological construct. Our results showed that high-level cognitive functioning plays an important role.

First, our results showed that in a post-conflict context, participants who were more open to reconciliation had more tempered judgements concerning conflict-related issues. The role of judgement in this study is in line with previous findings in the literature (Pham et al., 2004) and shows that one of the priorities for post-conflict societies could be to encourage the subjective perception of safety, which may promote more positive judgements about one's environment. In Rwanda, for the past few years, one way to achieve this has been to call for a massive presence of the army in the public space, especially in the capital city of Kigali. This has had a noticeable impact on objective safety in that country, compared to neighbouring states (see

<http://travel.gc.ca>, or <http://www.diplomatie.gouv.fr>) and may thus indirectly contribute to promoting reconciliation.

Second, openness to reconciliation was related to analytical thinking. Participants who were more inclined to inhibit genocide-related stereotypes and beliefs and to reason analytically about probabilistic and logical problems tended to be more open to reconciliation. This link between analytical thinking and reconciliation was observed only with genocide-related contents; there was no link with neutral-content reasoning. This finding suggests that what matters most is to reason analytically about trauma/conflict-related material, and not the general ability to reason analytically. In other words, what appears to be crucial is not individuals' overall level of 'rationality', but rather their willingness or motivation to engage into reflecting about conflict-related topics. This willingness depends partly on the availability of the cognitive tools necessary to do this, but also on the emotional and motivational dimensions of the task. We can speculate that contexts promoting such reasoning, or interventions designed to increase the motivation to reason analytically about conflict-related topics, would lead to an increase in positive attitudes towards reconciliation. If this is true, then it is important for governments and support structures (e.g., NGOs, victim associations) to increase such motivation, perhaps using didactic procedures implemented at the level of educational systems (Gamo, Nogry, & Sander, 2014) or the media (Paluck, 2009), in order to favour the engagement into different points of view and the construction of alternative representations in tasks involving conflict-related reflection and reasoning. It is possible that levels of attachment and identification to one's country and community affect the motivation or ability to override stereotypes. As such, place attachment may be one important underlying factor which drives rational reasoning about genocide-related topics in Rwanda and which influences reconciliation. This idea is consistent with previous work showing a link between "returning home" after a conflict, place attachment, and reconciliation (Eastmond, 2010), and will need to be evaluated in future studies.

The link between probabilistic reasoning and openness to reconciliation appeared to be mediated by judgement: when reflecting about the genocide, participants who were able to make use of genocide-related probabilistic information made less extreme estimates about genocide-related past facts and future likelihoods, and this was linked to higher openness to reconciliation. These effects were observed after controlling for general cognitive capacity, and were thus not a by-product of intelligence. These findings are consistent with previous data showing a link between reasoning and judgement, such that analytical thinkers tend to develop more moderate opinions about society-related issues (e.g., Pennycook et al., 2015). However, given that our study is correlational and based upon cross-sectional data, our interpretation concerning the direction of the mediation (i.e., statistical reasoning influencing judgement, and judgement influencing openness to reconciliation) is tentative and needs to be confirmed using an experimental or longitudinal design, in order to show that promoting analytical reasoning does indeed influence judgement, and attitudes as a result of this.

In this study, like in previous work, PTSD symptoms were related to openness to reconciliation (Arnold, 2011; Pham et al., 2004; Brounéus, 2010). Unlike PTSD symptoms,

genocide exposure was not related to openness to reconciliation. This finding suggests that it is not the objective experience of trauma as such – which governments and care facilities have no control over – but the reactions to these experiences that influence attitudes towards reconciliation. Although this does not, of course, mean that governments should ignore the seriousness of victims' exposure to trauma, it suggests that they should consider the psychological health of the whole population, including those who had less severe exposure to trauma.

We measured the effect of verbal fluency, used as an indicator of general cognitive capacity (Shao et al., 2014; Unsworth et al., 2010), and education, which is linked to abstract-thinking abilities and working memory capacity (Fry & Hale, 1996; Lee et al., 2007; Le Carret et al., 2003; Van Hooren et al., 2007). Contrary to what we hypothesized, both measures were negatively related to openness to reconciliation. These negative relationships – also observed in a previous Rwandan sample (Pham et al., 2004) – are non-intuitive (e.g., Pronk et al., 2010) and remain unexplained. They contrast with a large literature in western countries showing that higher levels of education are generally associated with less prejudice and more openness towards 'outgroups' (e.g., Wagner & Zick, 1995). The negative link between education/general cognitive capacity and openness to reconciliation may be the result of increased general knowledge and mistrust towards the elite in educated people (Finkel, Sabatini, & Bevis, 2000; Steen, 1996). In fact, the participants tested in this study had started their education before the genocide, a time when the policies behind the schooling system helped to reinforce societal differences and the conditions that led to the genocide (King, 2013). In any case, although the dominant view is that education and intelligence/abstract-thinking are key to reconciliation, the present results highlight that this may not always be the case. Future studies may attempt to distinguish effects of general knowledge and fluid intelligence, to test the possibility that while the former is a negative predictor of openness to reconciliation in Rwanda, the latter is not.

Other than education, the socio-economic and personal factors did not predict openness to reconciliation. This result might appear surprising given that attitudes towards outgroups have been shown to be linked to socioeconomic status or religiosity (e.g., Johnson, Rowatt, & LaBouff, 2012; Wagner & Zlick, 1995), and that religion was often reported by participants as an important support in their life. It is possible that the demographic and socio-economic measures used in this study were too coarse and lacked sensitivity to reveal an impact on openness to reconciliation.

Some studies interested in the question of reconciliation have focused on emotion and psychopathology (e.g., Bayer et al., 2007; Pham et al., 2004). Others have highlighted the importance of interpersonal factors and group dynamics. For instance, Bar-Tal and Cehajic-Clancy (2014; Bar-Tal, 2009) have discussed the central role of collective memories, myths, and shared identity, and have argued that, for reconciliation to occur, opposing parties must change their group identity and memories. Shnabel and Nadler (2008) have underlined that social exchanges between victims and aggressors are essential in order to allow reconciliation to occur. The current study offers a unique approach in that it focuses on cognitive functioning. It shows the importance of judgements or of the willingness to engage into analytical reasoning about conflict-related material. It is possible that such intra-individual variables are predictors of individuals' ability or

motivation to engage into the inter-individual processes described in previous studies (Bar-Tal & Cehajic-Clancy, 2014; Shnabel & Nadler, 2008).

In this work, we used a measure of openness to reconciliation which was hypothesised to entail several dimensions (e.g., truth and justice, coexistence, trust, and forgiveness; Zorbas, 2009). Some dimensions may inherently be more personal, such as forgiveness, while others may be more societal or related to people's view of the attitudes to foster positive relations between groups in society (Avruch, 2010). The literature regarding the concept of reconciliation and its underlying dimensions is scarce. While it will be important in future studies to break down these dimensions and their respective importance, this was not the object of the present work.

We used two tasks to measure analytical thinking, a base-rate task and a belief-bias task. It is possible that the former is less reliable for this purpose than the latter. This is because anecdotal data can have a level of empirical validity in the base-rate task. Thus, giving a response based upon anecdotal information can indeed reflect a level of inductive rationality (Jussim, 2015). However, given that both the base-rate and belief-bias tasks showed similar effects, it is unlikely that this potential confound entirely accounts for the effects observed on the base-rate task.

In conclusion, in order for post-conflict peacebuilding to succeed, not only is it important to implement global strategies such as the limitation of weapon proliferation or the instauration of law and order, it is also vital to better understand the underlying psychological safeguards against conflict at the level of the individual. With this aim in mind, the present study tested the role of high-level cognition in predicting openness to reconciliation. They showed that openness to reconciliation is influenced not only by psychological health, but also by cognitive functioning. This work confirmed that cognitive functioning is a major aspect to consider when developing reconciliation policies. We believe that a better understanding of the influence of cognition and information processing on openness to reconciliation might help develop simple and targeted actions at the level of official communications, media, and victim support structures (e.g., victim associations and NGOs) to speed up reconciliation prospects.

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