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Outcome-oriented moral evaluation in terrorists

Running title: Moral judgment in terrorists

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Supplementary Discussion

S1. A second control group of incarcerated subjects with no terrorist background was assessed with the moral judgment task. This sample included 13 men who were convicted of murder and began serving their sentence between five and eight years prior to testing (mean = 6.07, $SD = 1.33$). These subjects were paired in age ($F(2, 142) = .26, p = .76, \eta^2 = .003$) and years of formal education ($F(2, 142) = 1.81, p = .16, \eta^2 = .003$) with the terrorists and the control groups.

S2. A mixed-effects 3 (group: terrorist vs. non-criminal controls vs. incarcerated controls) $\times$ 2 (intention: neutral vs. negative) $\times$ 2 (outcome: neutral vs. negative) ANOVA crossing groups and conditions revealed that all groups judged actions with neutral intentions and neutral outcomes as more permissible than actions with negative intentions and negative outcomes [main effects of intention ($F(2, 142) = 413.68, p < .01, \eta^2 = .74$) and outcome ($F(2, 142) = 222.21, p < .01, \eta^2 = 0.61$)]. Furthermore, all groups judged accidental harm as more permissible than intentional harm [intention-by-outcome interaction ($F(1, 142) = 33.82, p < .01, \eta^2 = .19$)].

In addition, a significant three-way interaction was detected among intention, outcome, and group ($F(2, 142) = 4.57, p < .01, \eta^2 = .07$). A post-hoc analysis (Tukey HSD, $MS = .66, df = 235.7$) revealed that terrorists judged accidental harm as less permissible than non-criminals controls ($p < .01$) and incarcerated controls ($p < .01$). Moreover, terrorist judged attempted harm as more permissible than non-criminals ($p < .01$) and incarcerated controls ($p < .01$). There were no significant differences between terrorists and non-criminals ($p = .29$) or between terrorists and incarcerated controls ($p = .99$) in judgments of non-harm. No differences were observed for successful attempt to harm between terrorists and non-criminals ($p = .70$) or between terrorists and incarcerated controls ($p = .99$) (see Supplementary Figure 1).

S3. The terrorists' outcome-based moral judgment pattern resembles that observed in young children. Although, children can correctly differentiate intentional from accidental actions since very early ages ^{1,2}, when moral scenarios present conflicting information about the outcome of the action and the intention of the agent, their moral judgments are based on the former factor rather than the latter ^{3,4}.

S4. Social sciences theories ¹³ suggest that ideology and action are sometimes connected, but not always. Many terrorists are not ideologues or deep believers in an extremist doctrine. They are drawn to the group and its activities for other reasons. Indeed, people with radical ideas and violent justifications rarely engage in terrorism ¹³. These views indicate that there is no direct and unique causal connection between radical ideas and violence ¹³. Therefore, the link between terrorists' actions and ideology seems too complex to be strictly circumscribed to restricted domains. A full treatment of this relation is beyond the scope of this work. Further research should investigate whether there is a relationship between the strength of terrorists' ideological convictions and their moral judgment pattern

S5. Participants: Participants of the terrorist group included 66 incarcerated paramilitaries who participated in a collective demobilization supported by statutory Law 975/05 (*Ley de Justicia y Paz*, Justice and Peace Law)⁶. This Law sets forth a system of incentives to tell the truth, identify and punish perpetrators, and provide reparations to the victims. However, individuals who participated in this study have not been enrolled in any rehabilitation or reinsertion program.

S6. Since the time available to assess each individual in prison was very limited, we needed to choose a robust but brief tool to assess EFs. The IFS battery proved very adequate in this context, as it constitutes a well-validated⁷⁻¹¹ instrument which allows assessing various EFs in only a few minutes. Moreover, the IFS possesses better sensitivity and specificity than other brief EF tests^{9,11}. In addition, the IFS has been successfully employed in the assessment of clinical⁷⁻¹¹ and non-clinical¹² populations. The IFS primarily taps working memory and inhibitory control. In fact, the latter is one executive domains of interest, given that previous studies¹³⁻¹⁵ have shown an association between inhibitory control and aggressive behavior. Finally, the IFS strongly correlates with the performance on classical EF tasks^{7,9}. However, since the IFS does not replace a complete EF assessment, future studies in terrorist groups should evaluate this domain through a more comprehensive neuropsychological battery.

S7. The moral judgment task has proved sensitive in numerous social groups around the world, including Latin-American populations^{16,17}, which supports the cross-cultural validity of the moral scenarios considered here. Moreover, studies using this task in neurotypicals of various age groups¹⁶⁻²⁵ converge in showing that when intention and outcome are in conflict, moral judgments are construed by considering both factors (with the arguable exception of young children). Construct validity is further supported by a validation study conducted with 45 healthy volunteers (19 women, 26 men). Participants completed the moral judgment task and a validated moral sensitivity task^{17,25-27} evaluating various aspects of moral cognition (intentionality comprehension, empathic concern, and moral judgment) in the context of intentional and accidental harms. This paradigm comprises 25 animated scenarios (11 intentional, 11 accidental, 3 neutral) involving two individuals. Each scenario consists of three digital color pictures presented in a successive manner to imply motion. The durations of the first, second, and third pictures in each animation were 500, 200, and 1000 ms, respectively. The three following types of situations were depicted: (1) intentional harm, in which one person deliberately inflicts pain on another (e.g., one person purposely steps on someone else's toe); (2) accidental harm (e.g., one person accidentally inflicts pain on another); and (3) control or neutral situations involving no harm (e.g., one person hands a flower to another).

Since the protagonists' faces were not visible, participants were blind to their facial emotional reactions. Participants were asked to respond to six questions which evaluated: (a) intentionality comprehension (was the action done on purpose?), (b) intention of the perpetrator to hurt the victim (how bad was the purpose?), (c) empathic concern (how sad do you feel for the victim?), (d) degree of discomfort (how upset do you feel for what happened in the situation?), (e) correctness of the action (how inappropriate was the action?), and (f) punishment (how much penalty does this action deserve?). The question about intentionality was answered selecting "Yes" or "No". The other questions were

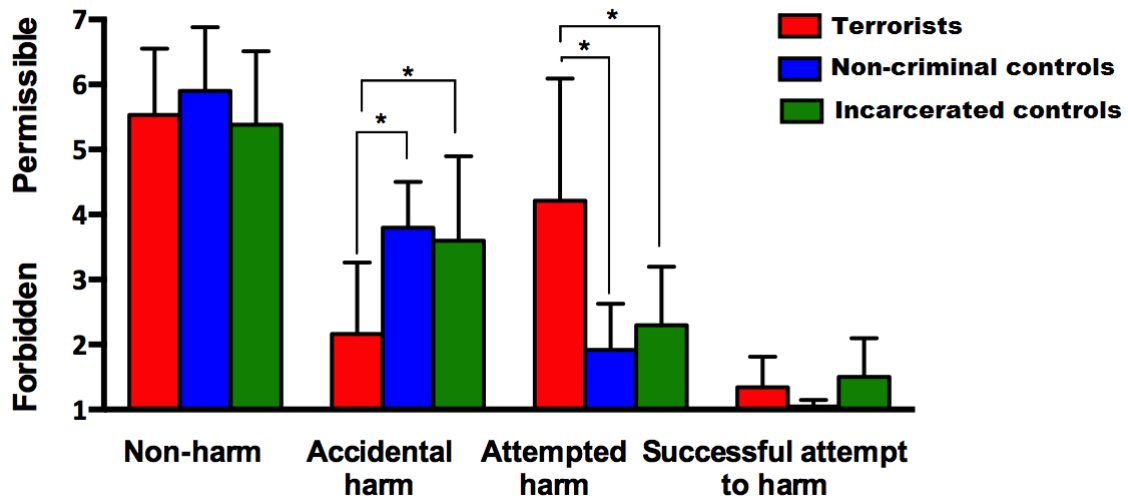
answered using a computer-based visual analogue scale ranging from -9 to 9 –these numbers were not visible to participants. We measured accuracy for the intentionality question, alongside ratings and raw reaction times for the other questions.

Results of the validation study

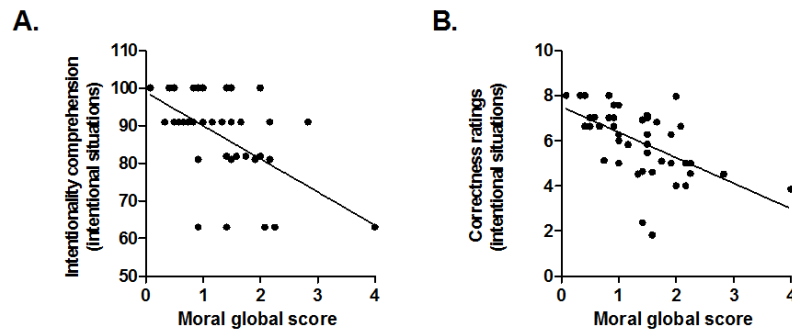
The participants' mean age was 56.06 ($SD = 16.24$) and they had a mean of 16.66 ($SD = 6.79$) years of education. Results of the moral judgment task showed that participants judged actions with neutral intentions and neutral outcomes as more permissible than actions with negative intentions and negative outcomes [main effects of intention ($F(1, 44) = 325.27, p < .01, \eta^2 = .88$) and outcome ($F(1, 44) = 63.41, p < .01, \eta^2 = 0.60$)]. Furthermore, there was a significant interaction between intention and outcome ($F(1, 44) = 29.01, p < .01, \eta^2 = .40$). A post-hoc analysis (Tukey HSD, $MS = .48, df = 44$) revealed that accidental harm was judged as more permissible than intentional harm ($p < .01$).

In addition, we estimated an overall moral judgment profile by calculating a global moral score which included the conditions in which intention and outcome are in conflict (i.e., accidental harm and attempted harm). This score was represented by the average of the difference between raw scores for accidental and attempted harm and the maximum expected rating for each condition (7 and 1, respectively): the higher this global score, the more morally deviant the sample's performance. We explored the relationship between this global moral score and the measures of the moral sensitivity task evaluating different aspects of intentionality comprehension, empathy, and moral judgment. Supporting the validity of the moral judgment task, the global moral score was significantly correlated with intentionality comprehension ($r = -.57, p < .001$) and correctness ratings for intentional harm ($r = -.55, p < .001$) (see Supplementary Figure 2). Thus, performance on the moral judgment task correlates with performance on previously validated measures of moral sensitivity and moral evaluation^{17,26,28}.

Supplementary Figures



Supplementary Figure 1. Moral judgments of terrorists, non-criminals, and incarcerated controls. Asterisks indicate significant differences.



Supplementary Figure 2. Relationship between performance on the moral judgment task (global moral score) and other measures of moral sensitivity (intentionality comprehension) and moral evaluation (correctness ratings).

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