



Is severe alcohol use disorder really associated with increased utilitarian moral judgment? Exploration using the CNI model

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ABSTRACT

Objectives: The psychology of moral decision-making classically contrasts utilitarianism (based on consequences) and deontology (based on moral norms). Previous studies capitalizing on this dichotomy have suggested the presence of a utilitarian bias among patients with severe alcohol use disorder (SAUD). We aimed to further disentangle the processes involved in such bias through a more validated approach, the CNI model of moral decision-making. This model allows to go further than the classical approach by distinguishing sensitivity to consequences (C), to moral norms (N), and general preference for inaction over action (I) in response to moral dilemmas.

Methods: Thirty-four recently detoxified patients with SAUD and 34 matched control participants completed a battery of 48 dilemmas derived from the CNI model, as well as social cognition tasks.

Results: In contrast with the utilitarian bias suggested in previous studies based on the classical approach, patients with SAUD did not show an increased sensitivity to consequences in comparison with control participants. However, they showed a reduced sensitivity to moral norms, as well as a greater action tendency. These biases were not related to social cognition deficits.

Conclusions: Patients with SAUD are not more utilitarian than healthy controls, this previously reported bias being artificially generated by the methodological limits of the classical approach. Instead, they present a reduced sensitivity to moral norms and an action bias, which might impact their interpersonal relations and contribute to the social isolation frequently reported in this population, thus identifying moral decision-making as a new therapeutic lever in SAUD.

1. Introduction

Severe alcohol use disorder (SAUD) is characterized by physiological and cerebral impairments (Bühler and Mann, 2011), but also by cognitive deficits (Stavro et al., 2012) encompassing executive functions (Brion et al., 2017) and decision-making (Brevers et al., 2014; Kornreich et al., 2013). Recent studies have also demonstrated widespread social cognition deficits (Bora and Zorlu, 2016; Pabst et al., 2022), fostering daily-life interpersonal difficulties (Kilian et al., 2021; Maurage et al., 2012). However, previous studies on social cognition have used non-ecological tasks based on external judgements about emotional states/situations, without personal involvement in the situation. More ecological experiments are required to assess the actual social behaviour

of patients and to understand the links between social cognition and interpersonal difficulties in SAUD.

Moral dilemmas constitute an efficient way to explore social decision-making. The classical approach of moral psychology opposes utilitarian (consequence-based) and deontological (moral norms-based) responses (Greene, 2004). This approach uses social dilemmas, like the *trolley problem* (Foot, 1967), requesting a decision that impacts the life/well-being of others and where deontological/utilitarian responses are respectively driven by automatic emotional versus controlled cognitive processes (Greene et al., 2001; Greene, 2009). Consequently, reduced emotionality/empathy should lead to decreased deontological responses, while impaired cognitive functioning should lead to decreased utilitarian responses (Duke and Bègue, 2015). As patients

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with SAUD have impairments in both higher-order executive functioning and social cognition, moral dilemmas might help clarifying the mechanisms involved in social decision-making. Using this classical approach, three studies reported an utilitarian bias in SAUD, underlaid by reduced emotional/interpersonal abilities (reducing their sensitivity to social norms) combined with preserved executive abilities to make moral decisions (Carmona-Perera et al., 2013; 2014; Duke and Bègue, 2015; Khemiri et al., 2012).

However, this classical approach of moral judgment presents several limits: (1) the dilemmas used are often unrealistic (Bauman et al., 2014; Gawronski et al., 2017); (2) it conceptualizes deontological/utilitarian responses as two opposites of one continuum, although consequences and moral norms are independent factors (Conway and Gawronski, 2013); identical responses can thus be underpinned by different combinations; (3) there is no manipulation of the central features of this consequences/moral norms opposition. Indeed, to categorize a response as utilitarian/deontological, it is essential to check that it is sensitive to consequences/moral norms, respectively. This requires a comparison of judgments across scenarios with various consequences (Gawronski and Beer, 2016) and moral norms (e.g., proscriptive versus prescriptive norms; Janoff-Bulman et al., 2009). The classical approach uses homogeneous dilemmas systematically involving proscriptive norms and consequences pattern (where benefits of action outweigh its costs); (4) it uses dilemmas where utilitarian/deontological judgments are conflated with action/inaction, respectively (Crone and Laham, 2017), as action is always associated with utilitarian decisions. Although previous studies exploring moral dilemmas in SAUD provided initial insights, the classical approach they focused on hampered to isolate the influence of each factor, and their results could therefore be misleading. To overcome these limitations, the CNI model of moral decision-making (Gawronski et al., 2017), based on a multinomial modelling tree, compares the responses to four types of dilemmas involving different consequences (i.e., benefits of action greater vs smaller than costs) and norms (i.e., prescriptive vs proscriptive norms; Fig. 1) (Gawronski and Beer, 2016; Gawronski et al., 2017, 2018). To control omission biases (i.e., the tendency to favour inaction because harm caused by action is perceived as worse than equivalent harm caused by inaction; Jamison et al., 2020), they evaluate the presence of a general action versus inaction tendency. The model thus independently quantifies the sensitivity to consequences (C) and moral norms (N), but also the general preference for inaction (I).

All dilemmas proposed are inspired by real-world cases, increasing ecological value (Gawronski et al., 2017; Supplementary Table A).

Previous studies did not determine whether the utilitarian bias in SAUD is due to increased sensitivity to consequences and/or reduced sensitivity to moral norms and did not control for inaction tendency. Capitalizing on the extended battery of dilemmas from the CNI model (Körner et al., 2020), we explored the psychological processes underlying social decision-making in SAUD. Moreover, moral judgment relates to social cognition abilities, including Theory of Mind (Greene and Haidt, 2002; Reniers et al., 2012), emotional decoding (Carmona-Perera et al., 2014) and empathy (Nasello and Triffaux, 2023). We thus evaluated these social cognition subcomponents through the mini-SEA (mini Social cognition & Emotional Assessment; Quesque et al., 2020) and the EQ (Empathy Quotient; Baron-Cohen and Wheelwright, 2004).

We hypothesized that (1) the utilitarian bias found earlier in SAUD is due to a higher sensitivity to consequences; (2) patients with SAUD will show reduced sensitivity to moral/social norms, as patients display deficits on tasks (e.g., Faux-Pas Test, Stone et al., 1998) evaluating the understanding of social rules (Thoma et al., 2013; Schmid et al., 2021); (3) social cognition deficits in SAUD will be positively/negatively correlated with the sensitivity to consequences/moral norms, respectively; (4) patients will present an empathy deficit, as measured through the EQ, and this deficit will be positively/negatively correlated with the sensitivity to consequences/moral norms, respectively; (5) patients will show higher inaction tendency than healthy controls due to their apathy (Yang et al., 2020).

2. Methods

2.1. Pre-registration and data availability

We pre-registered our hypotheses, design, sample size rationale and analysis plan on the Open Science Framework: <https://doi.org/10.17605/OSF.IO/ZGMXV>. We justify departures from this original plan in the corresponding sections. All materials and data are available on the Open Science Framework: https://osf.io/wnx6z/?view_only=88187665dfe41409b2d937265094b99.

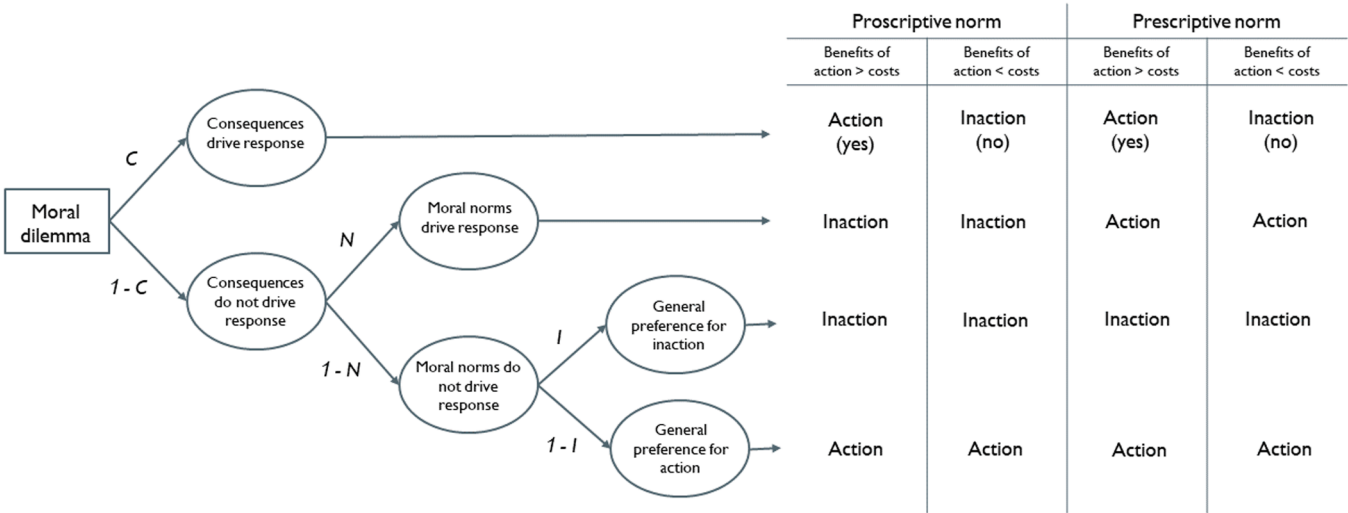


Fig. 1. Illustration of the CNI model [adapted from Gawronski et al. (2017)]. This figure presents the multinomial processing tree disentangling the successive cognitive processes predicting final responses (i.e., performing the action versus refraining to do so) in moral dilemmas, including (1) consequences, involving benefits of action that are greater or smaller than costs; (2) proscriptive or prescriptive norms; (3) action versus inaction tendency. The three model parameters refer to the probabilities that judgments are due to sensitivity to consequences (C), sensitivity to norms (N), or a general preference towards inaction (I). The right side represents the answers of the participants (action vs. inaction), depending on the type of dilemma.

2.2. Participants

A priori power analyses in G*Power v3.1.9.7 estimated that a sample size of 35 participants per group was required, based on the medium effect-sizes observed in previous studies, with a significance level of 0.05 and a desired power of 0.8. We thus recruited 35 patients with SAUD according to DSM-5 criteria (evaluated through the Mini International Neuropsychiatric Interview, MINI; Sheehan et al., 1998) from alcohol detoxification units in Belgian hospitals. They had all abstained from alcohol for at least 7 days and were free of other psychiatric comorbidities (except nicotine dependence and/or mild anxiety/depression disorder). This group was matched on sex and age with 35 healthy control participants, having a score lower than 8 at the Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993) and drinking less than ten alcohol units (i.e., one unit corresponding to 10 g of pure ethanol) per week without exceeding three units per day. Control participants had no history of psychiatric disorder or substance use disorder, neither a family history of SAUD. Exclusion criteria for both groups included (1) major past/present medical/neurological problems, (2) history of head injury with prolonged loss of consciousness, (3) other substance use disorder, (4) psychotropic medication, (5) uncorrected poor vision, (6) not French as mother tongue, as foreign language elicits a utilitarian bias (Costa et al., 2014).

2.3. Experimental measure: social moral dilemmas

We used the CNI-based extended battery of 12 scenarios, each declined in four types of distinct dilemmas involving different consequences and norms, which leads to a total of 48 moral dilemmas (Körner et al., 2020). We translated the dilemmas in French following the reversed translation method (Vallerand, 1989). First, two translators translated the dilemmas into French. These two versions were then translated back into English by two other translators and compared with the initial English version. We organized a consensus meeting with all translators and three other researchers to examine the discrepancies between the English back translation and the original version, and to compare the two French translations. We also followed two rules (Spielberger and Sharma, 1976), namely we (1) focused on the meaning of the dilemmas rather than on a word-for-word translation; (2) respected the unique psycholinguistic properties of the target language. We then contacted the original author to check the intended meaning of some dilemmas where synonyms can lead to different meanings and we consulted a French linguist to check the final version.

2.4. Social cognition measures

We evaluated two social cognition components, namely emotion processing and Theory of Mind, using the mini-SEA (Quesque et al., 2020). This validated test comprises two subtests, a *Facial Emotion Recognition task*, and a *Faux-Pas task*. The *Facial Emotion Recognition task* is composed of 35 pictures of male and female faces expressing an emotion. These pictures are presented for maximum 12 seconds each and the participant has to identify which emotion is expressed. The *Faux-Pas task* is composed of 10 short stories describing a social interaction, in which one character might commit a social clumsiness (a *faux-pas*). Participants must detect the misstep and explain it. After each story, we asked two control questions to assess the overall understanding of the story. We also measured empathy through the Empathy Quotient questionnaire (EQ; Baron-Cohen and Wheelwright, 2004).

2.5. Psychological measures

Participants filled in questionnaires evaluating psychopathological processes potentially related to social moral dilemmas: interpersonal problems (Inventory of Interpersonal Problems, IIP-64; Horowitz et al., 2003), depression (Beck Depression Inventory, BDI; Beck et al., 1961),

anxiety (State-Trait Anxiety Inventory, STAI-A/B; Spielberger and Gorsuch, 1983), and social anxiety (Liebowitz Social Anxiety Scale, LSAS; Liebowitz, 1987).

2.6. Procedure

We first screened all participants to ensure they filled the inclusion criteria. All participants provided written informed consent and were not aware of the hypotheses. Participants were then presented with the 48 social moral dilemmas. As in Gawronski et al. (2017), we explicitly told participants that some scenarios may seem similar at first glance, but some details are different. For each dilemma, we asked two questions: (1) is it acceptable to perform the described action (moral judgment)? and (2) would you do it (moral action)? Participants had to answer “yes” or “no” to both questions. We included two attention checks in the middle and end of the task. Then, participants performed the mini-SEA (Quesque et al., 2020) and filled the questionnaires. At the end of the testing, we debriefed with all the participants and controls received a financial compensation. We performed the study protocol in accordance with the Declaration of Helsinki and it was approved by the Ethics Committee of the Saint-Luc-UCLouvain Clinics and the local Ethics Committee of the hospitals.

2.7. Statistical analyses

We excluded one patient and one control because they did not succeed the attention checks, which led to a final sample of 34 participants per group. We excluded the *abduction dilemmas* from the analyses because this scenario present poor construct validity (Gawronski et al., 2020). We thus analyzed the results on 44 dilemmas (11 scenarios, each declined in four distinct dilemmas). We focused our analyses on the moral action as we were interested in the underlying processes of effective decision-making in SAUD and not in general judgment without personal involvement. Our aim was to increase the ecological value of social moral dilemmas tasks and the link with real-life difficulties experienced by patients with SAUD. Moreover, our preregistered hypotheses related to the difference between answers related to moral action and moral judgment could not be tested as the model did not fit the data for moral judgment. The parameters could thus not be validly interpreted (e.g., Hütter 2016). We performed multinomial analyses following the original method (Gawronski et al., 2017). We computed the sum of “action”/“inaction” responses among all participants for each type of dilemma and each condition. We then used the software *multi-Tree* by Moshagen (2010) to assess the goodness-of-fit of the model in describing the data and to compute estimates for the three parameters in individual analyses (Körner et al., 2020). The estimation algorithm had random start values, two replications, and a maximum of 90,000 iterations. With two groups (patients with SAUD, healthy controls), the model had a total of 8 free categories (i.e., responses to four types of dilemmas for each of the two groups) and a total of 6 parameters [i.e., three parameters (consequences, norms and inaction tendency) estimated for each group], which result in a difference of 2 for the degrees of freedom of the model. In the pre-registration, we planned to perform a 2×3 ANOVA to allow the inclusion of psychopathological variables as covariates. As none of these variables were to be included as covariate in our analyses (because they showed no link with the three parameters of the model), and as the original analyses proposed for the model fully covered the results related to the ANOVA, the results of this ANOVA are not reported.

We then ran the model at the individual level to extract the C, N and I parameters for each participant. This analysis confirmed that the model was suitable for our dataset with a summed fit score's p-value higher than .05 ($p=0.649$). The software multiTree reported a warning message for the analyses of one patient and five controls (such issue having been reported in previous studies, e.g., Körner et al., 2020). The problem concerned all participants presenting a similar pattern of responses

leading to an estimation of *N* parameter equal to 1. The algorithm failed to estimate their *I* parameter which is therefore not defined and will be coded as missing data in further analyses. Indeed, the CNI model is hierarchical, the *C* parameter being first estimated, then the *N* and lastly the *I*. These six individuals displayed a perfect sensitivity to norms, their *N* parameter being thus estimated to 1. Given that to estimate the *I* parameter, we follow the path 1-C*1-N*I (Fig. 1) and that *N*=1 for these individuals, the algorithm fails to estimate the *I* parameter because 1-N=0. The hierarchy of the model cannot be modified as the *I* parameter is theoretically conditioned to the absence of *C* and *N*. If the *N* parameter equals 1, the *I* parameter is not defined and we obtained different values each time the analysis was run. The estimate of *I* can therefore not be used for these individuals, which were then coded as missing data.

We also performed Pearson correlational analyses between the *C*, *N* and *I* parameters and (1) social cognition measures [i.e., evaluated through the adapted mini-SEA (Quesque et al., 2020)]; (2) EQ score; (3) psychopathological measures.

3. Results

3.1. Demographic, psychopathological, and alcohol-related measures

Patients with SAUD and controls did not differ for age, sex, state anxiety and the anxiety facet of the LSAS (*p*>.05, Table 1). Patients showed higher scores for depression (BDI) [*t*(63)=6.125, *p*<.001, *d*=1.521, trait anxiety [*t*(63)=5.322, *p*<.001, *d*=1.322], the avoidance facet of LSAS [*t*(61)=2.106, *p*=.039, *d*=.532] and the AUDIT [*t*(29.99)=19.247, *p*<.001, *d*=5.355]. Patients also reported more interpersonal problems as indexed by the IIP-64 total score [*t*(61)=2.819, *p*=.006, *d*=.713]. The subscales' analysis revealed group differences in *Domineering* [*t*(61)=2.008, *p*=.049, *d*=.508], *Self-Centered* [*t*(61)=3.738, *p*<.001, *d*=.977], *Self-sacrificing* [*t*(61)=3.471, *p*<.001, *d*=.877] and *Intrusive/Needy* [*t*(61)=3.305, *p*=.002, *d*=.835] facets.

Table 1
Sociodemographic, psychopathological, interpersonal problems and alcohol consumption variables in patients with SAUD and HC [Mean (SD)].

	Patients (N=34) M (SD)	Controls (N=34) M (SD)
Demographic measures		
Age ^{ns}	46.59 (10.00)	46.88 (11.39)
Education (in years since starting primary school)*	14.24 (3.50)	16.12 (2.54)
Sex (female/male) ^{ns}	15/19	18/16
Psychopathological measures		
BDI *** ^a	10.23 (4.90)	3.71 (3.64)
STAI-A ^{ns}	34.50 (9.41)	32.79 (11.43)
STAI-B *** ^a	51.81 (8.56)	38.68 (11.04)
LSAS ^{ns} , ^b	49.97 (29.74)	38.18 (32.14)
Anxiety ^{ns}	24.62 (16.37)	20.94 (17.20)
Avoidance *	25.34 (14.84)	17.24 (15.56)
Interpersonal problems		
IIP-64 total **, ^b	96.57 (34.74)	71.56 (35.41)
Domineering *	7.63 (4.64)	5.50 (3.78)
Self-centered ***	10.57 (5.07)	6.47 (3.29)
Cold / Distant ^{ns}	9.55 (6.88)	7.29 (4.46)
Socially inhibited ^{ns}	11.98 (7.37)	10.03 (8.24)
Non-assertive ^{ns}	15.44 (8.21)	11.74 (8.98)
Overly accommodating ^{ns}	14.58 (6.97)	12.00 (6.81)
Self-sacrificing ***	17.85 (5.77)	12.26 (6.63)
Intrusive / Needy **	10.28 (5.52)	6.03 (4.69)
Alcohol consumption measures		
AUDIT *** ^c	29.20 (7.11)	2.50 (3.86)
Number of units per day	18.76 (12.66)	-
Number of previous detoxifications	2.50 (3.86)	-

Note: ^{ns} = non-significant, * *p* <.05, ** *p* <.01, *** *p* <.001, ^a = 3 missing data, ^b = 5 missing data, ^c = 6 missing data

3.2. Classical analysis

We first analyzed the data following the classical approach of moral decision-making, namely by focusing exclusively on dilemmas involving a proscriptive norm and where the benefits of action outweigh its costs (Table 2). This analysis revealed that patients with SAUD are more inclined to endorse the described action than controls [*t*(66)=2.610, *p*<.05, *d*=.633], which has previously been interpreted as an utilitarian bias. This result thus perfectly replicates previous studies, as the classical analysis suggests an apparent utilitarian bias in SAUD.

3.3. CNI model

The CNI model fits the data well [*G*²(2)=2.320, *p*=.313]. Contrary to our hypothesis, the analyses revealed no difference between patients with SAUD and controls on the *C* parameter [$\Delta G^2(1)=3.218$, *p*=.073], which means that patients with SAUD are not more sensitive to consequences than controls in their response to social moral dilemmas (Fig. 2). This result contradicts the interpretation of data made in previous studies which found a utilitarian bias in SAUD. However, the *N* parameter significantly differed between groups [$\Delta G^2(1)=20.700$, *p*<.001], patients being less sensitive to moral norms than controls, which confirms our second hypothesis. The *I* parameter also differed significantly between groups [$\Delta G^2(1)=37.665$, *p*<.001], indicating that patients display a lower inaction tendency, in contradiction with our third hypothesis.

3.4. Social cognition

Patients with SAUD (*M*=83.26;*SD*=6.03) scored lower on the percentage of emotion correctly identified than controls (*M*=87.40; *SD*=6.75) [*F*(1,66)=7.173, *p*=.009, $\eta^2=.098$], with no Group*Emotion interaction. When analyzing the errors, we found that patients presented a surprise overestimation bias [*t*(66)=2.908, *p*=.035, *d*=.705], as they tended to incorrectly attribute *surprise* to others emotions displayed. No difference appeared between groups regarding the *faux-pas* task [*t*(66)=.453, *p*=.652] but groups differed for the control questions score [*t*(66)=2.199, *p*=.031, *d*=-.533], with patients (*M*=19.15, *SD*=.958) presenting lower score than controls (*M*=19.65, *SD*=.917). Regarding empathy, groups did not differ on the EQ total score [*t*(60)=.233, *p*=.816], neither on the questionnaire's subscales.

3.5. Correlational analyses

The only statistically significant correlation was between the *C* parameter and the *faux-pas* score for the SAUD group (*r*=.516, *p*=.002),

Table 2
Response profile related to the four types of moral dilemmas in patients with SAUD and HC [Mean (SD)]. The means represent the number of accepted dilemmas out of 11 (i.e., the participants responded if they would perform the described action).

	Patients (N=34) M (SD)	Controls (N=34) M (SD)	t	p-value
Proscriptive norm, benefits of action greater than its costs	6.09 (2.690)	4.41 (2.607)	2.610	.011
Proscriptive norm, benefits of action lower than its costs	2.85 (2.819)	1.06 (1.153)	3.435	.001
Prescriptive norm, benefits of action greater than its costs	8.65 (1.686)	8.82 (1.623)	-.440	.662
Prescriptive norm, benefits of action lower than its costs	6.12 (2.982)	5.12 (2.086)	1.602	.114

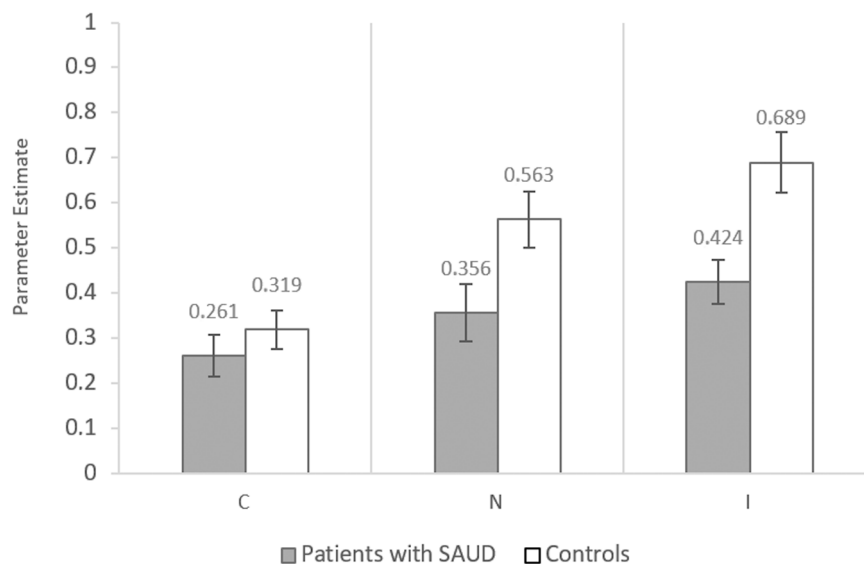


Fig. 2. Parameters estimates of sensitivity to consequences (C), sensitivity to norms (N) and general preference for inaction (I). Error bars depict 95 % confidence intervals.

patients being more sensitive to consequences in their moral decision-making also being the ones better in Theory of Mind, which contradicts our hypothesis. Regarding empathy, we found a positive correlation between the EQ total score and the C parameter ($r=.422$, $p=.028$), supporting our hypothesis.

Regarding our exploratory analyses, no significant correlation per group appeared between the three parameters (i.e., C, N and I) and the psychological measures (see [Supplementary Table B](#)). As groups were not matched on education, we performed correlational analyses which revealed that education was not correlated with any parameter of the CNI model when analyzing the whole sample. Within-group correlations showed a positive association between C parameter and education, but education was not a predictor of C when included as a covariate [$F(1,65)=2.324$, $p=.132$].

4. Discussion

Moral psychology opposes utilitarianism and deontology. Several studies have identified a utilitarian bias in SAUD ([Carmona-Perera et al., 2013, 2014](#); [Khemiri et al., 2012](#)) but this classical approach has key limitations. [Gawronski et al. \(2017\)](#) proposed a new model allowing to quantify the underlying processes of moral decision-making (i.e., consequences, norms or inaction tendency). Through this model, our study revealed that patients with SAUD are not more sensitive to consequences than controls, which contradicts the utilitarian bias previously suggested. Patients were actually less sensitive to moral norms, and displayed a lower inaction tendency. However, when analyzing our data using the classical approach (i.e., focusing exclusively on social moral dilemmas involving a proscriptive norm where the benefits of action exceed its costs), we identified an apparent utilitarian bias in SAUD, confirming that such classical approach is misleading. Indeed, the utilitarian bias found in SAUD is related to the inability of previous studies to distinguish sensitivity to consequences, norms and inaction tendency, as patients are not more sensitive to consequences, which is the core feature of utilitarianism. Nonetheless, a lower sensitivity to moral norms combined with a higher action tendency made participants' responses in the classical approach appear utilitarian. These results indicate that the utilitarian bias in SAUD identified earlier is explained by misleading results induced by the selected dilemmas. What was interpreted as a sensitivity to consequences was an action tendency coupled with a lower sensitivity to moral norms. The CNI model clarified the underlying mechanisms of social decision-making in SAUD, totally revisiting

previous conclusions.

Our results can be interpreted based on the interaction between cognition and social cognition impairments in SAUD. The dual-process theory of moral judgment suggests that a deficit in higher-order cognitive functioning leads to decreased utilitarian responses, while a deficit in emotional or interpersonal processes leads to decreased deontological responses ([Duke and Bègue, 2015](#)). The present data thus suggest that the influence of social cognition impairments exceeds the one related to cognitive deficits in our sample, as patients display lower sensitivity to norms while their sensitivity to consequences is preserved. In line with this proposal, and while we did not show group differences regarding Theory of Mind, our groups differed on emotion recognition abilities. Such emotional identification deficit, by lowering the ability to consider other individuals' feelings, might be involved in the reduced sensitivity to interpersonal norms. However, we failed to show a direct correlation between emotion recognition abilities and the N-parameter. The insensitivity to social norms might hence be more closely related to the social cognition dimension more directly associated with social behaviors, namely the "Social Perception and Knowledge" subdimension of social cognition. Some studies showed that patients with SAUD experience difficulties in the identification and reasoning about social rules ([Kornreich et al., 2011](#); [Pabst et al., 2021; 2024](#)). This social cognition component has been little explored in SAUD ([Pabst et al., 2022](#)) and its impact on moral decision-making should be further explored through tasks evaluating social norms that are more closely related to moral dilemmas (e.g., [Peyroux et al., 2019](#)). The higher action tendency displayed by patients might be related to their greater impulsivity ([Coskunpinar et al., 2013](#); [Dick et al., 2010](#); [Lejuez et al., 2010](#)). Impulsivity is a multidimensional construct, including urgency and lack of premeditation. These facets, which are respectively defined as acting rashly following emotional activation and acting without forethought, have the strongest effect for SAUD ([Coskunpinar et al., 2013](#)), which is in line with our results showing higher action tendency for patients.

Despite the CNI model has been widely used and is considered a reliable approach to moral decision-making, several debates remain regarding this model ([Baron and Goodwin, 2020; 2021](#); [Gawronski et al., 2020](#)), notably related to the ambiguities in the supposedly matched scenarios (e.g., perception of the norms and consequences and their respective values) or its ability to measure general action/inaction biases ([Baron and Goodwin, 2020; 2021](#); [Skovgaard-Olsen and Klauer, 2023](#)). These critics recently led to updated models, like the proCNI ([Hennig and Hütter, 2020; 2021](#)) or the CNIS model ([Skovgaard-Olsen](#)

and Klauer, 2023). While these models do not invalidate our results, future studies might use them to further specify the processes involved in moral decision-making in SAUD. We must also point out that our sample size, although sufficient to identify group differences according to our *a priori* power analysis, remains limited compared to previous studies using the CNI model (e.g., Körner et al., 2020; Kroneisen and Steghaus, 2020; Paruzel-Czachura et al., 2021). Finally, even though education was not a predictor of the C parameter when included as a covariate, we cannot exclude a partial effect of education on the sensitivity to consequences, due to their positive association in correlational analyses. It would therefore be useful to replicate these results on larger and carefully matched patient samples.

In conclusion, we offered the first insights about the underlying processes of moral decision-making in SAUD through the CNI model. This led to reinterpret previous results obtained with the biased classical approach, unduly suggesting a utilitarian bias in SAUD. We showed that SAUD is not related to such utilitarian bias, but rather to a reduced sensitivity to social norms, combined with higher action tendency. Given that moral decision-making is first and foremost social, such dilemmas constitute a highly relevant measure to understand how patients with SAUD make decisions in everyday life, and to bridge the gap between experimentally observed social cognition deficits and real-life difficulties reported in interpersonal contexts. Indeed, patients with SAUD often report more interpersonal problems than controls (Maurage et al., 2017) and we confirmed this result. The way we make decisions in our social life can highly influence our social interactions. Having insights about the processes guiding these decisions is crucial to understand why patients with SAUD encounter such difficulties. For example, being less sensitive to moral norms may lead individuals with SAUD to make decisions that seem inappropriate for other people or might even hurt them, as social norms have a high impact on our interactions (Argyle et al., 1985) and play an important role in guiding people's decisions (Manning, 2009). People expect that, by adhering to social norms, they will act efficiently and be socially approved (Cialdini et al., 1990; Geber and Hefner, 2019). Our study is thus a key first step towards more ecological studies linking social cognition deficits with the interpersonal problems observed in SAUD, in view of the high relevance such links have in the daily life and clinical outcomes of patients. New paradigms should be developed to explore social decision-making in ecological contexts (e.g., economic games) and to further determine the links between social cognition deficit, social decision-making and interpersonal difficulties. A better understanding of these mechanisms could optimize relapse prevention strategies, by reducing patients' interpersonal difficulties, negatively impacting the course of the disorder.

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Nothing declared

Contributors

Study conceptualization and methodology were developed by MG, JM, XdL and PM. Material preparation was performed by MG, under the supervision of PM. Data collection was performed by MG, under the joint supervision of PM and XdL. The analyses were performed by MG and JM. The first draft of the manuscript was written by MG and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

CRediT authorship contribution statement

Pierre Maurage: Writing – review & editing, Supervision, Project administration, Methodology, Funding acquisition, Conceptualization. **Jessica Mange:** Writing – review & editing, Visualization, Methodology, Formal analysis, Conceptualization. **Mado Gautier:** Writing –

original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Xavier De Longueville:** Writing – review & editing, Supervision, Investigation, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.drugalcdep.2024.112435.

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